Willow Creek Subbasin Assessment and TMDLs

Department of Environmental Quality

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GIS Coverages:

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Glossary

305(b)	Refers to section 305 subsection “b” of the Clean Water Act. 305(b) generally describes a report of each state’s water quality, and is the principle means by which the U.S. Environmental Protection Agency, Congress, and the public evaluate whether U.S. waters meet water quality standards, the progress made in maintaining and restoring water quality, and the extent of the remaining problems.
§303(d)	Refers to section 303 subsection “d” of the Clean Water Act. 303(d) requires states to develop a list of waterbodies that do not meet water quality standards. This section also requires total maximum daily loads (TMDLs) be prepared for listed waters. Both the list and the TMDLs are subject to U.S. Environmental Protection Agency approval.
Acre-Foot	A volume of water that would cover an acre to a depth of one foot. Often used to quantify reservoir storage and the annual discharge of large rivers.
Adsorption	The adhesion of one substance to the surface of another. Clays, for example, can adsorb phosphorus and organic molecules
Aeration	A process by which water becomes charged with air directly from the atmosphere. Dissolved gases, such as oxygen, are then available for reactions in water.
Aerobic	Describes life, processes, or conditions that require the presence of oxygen.
Assessment Database (ADB)	The ADB is a relational database application designed for the U.S. Environmental Protection Agency for tracking water quality assessment data, such as use attainment and causes and sources of impairment. States need to track this information and many other types of assessment data for thousands of waterbodies, and integrate it into meaningful reports. The ADB is designed to make this process accurate, straightforward, and user-friendly for participating states, territories, tribes, and basin commissions.
Adfluvial	Describes fish whose life history involves seasonal migration from lakes to streams for spawning.
Adjunct	In the context of water quality, adjunct refers to areas directly adjacent to focal or refuge habitats that have been degraded by human or natural disturbances and do not presently support high diversity or abundance of native species.

Alevin	A newly hatched, incompletely developed fish (usually a salmonid) still in nest or inactive on the bottom of a waterbody, living off stored yolk.
Algae	Non-vascular (without water-conducting tissue) aquatic plants that occur as single cells, colonies, or filaments.
Alluvium	Unconsolidated recent stream deposition.
Ambient	General conditions in the environment. In the context of water quality, ambient waters are those representative of general conditions, not associated with episodic perturbations, or specific disturbances such as a wastewater outfall (Armantrout 1998, EPA 1996).
Anadromous	Fish, such as salmon and sea-run trout, that live part or the majority of their lives in the salt water but return to fresh water to spawn.
Anaerobic	Describes the processes that occur in the absence of molecular oxygen and describes the condition of water that is devoid of molecular oxygen.
Anoxia	The condition of oxygen absence or deficiency.
Anthropogenic	Relating to, or resulting from, the influence of human beings on nature.
Anti-Degradation	Refers to the U.S. Environmental Protection Agency's interpretation of the Clean Water Act goal that states and tribes maintain, as well as restore, water quality. This applies to waters that meet or are of higher water quality than required by state standards. State rules provide that the quality of those high quality waters may be lowered only to allow important social or economic development and only after adequate public participation (IDAPA 58.01.02.051). In all cases, the existing beneficial uses must be maintained. State rules further define lowered water quality to be 1) a measurable change, 2) a change adverse to a use, and 3) a change in a pollutant relevant to the water's uses (IDAPA 58.01.02.003.56).
Aquatic	Occurring, growing, or living in water.
Aquifer	An underground, water-bearing layer or stratum of permeable rock, sand, or gravel capable of yielding of water to wells or springs.
Assemblage (aquatic)	An association of interacting populations of organisms in a given waterbody; for example, a fish assemblage, or a benthic macroinvertebrate assemblage (also see Community) (EPA 1996).
Assimilative Capacity	The ability to process or dissipate pollutants without ill effect to beneficial uses.
Autotrophic	An organism is considered autotrophic if it uses carbon dioxide as its main source of carbon. This most commonly happens through photosynthesis.

Batholith	A large body of intrusive igneous rock that has more than 40 square miles of surface exposure and no known floor. A batholith usually consists of coarse-grained rocks such as granite.
Bedload	Material (generally sand-sized or larger sediment) that is carried along the streambed by rolling or bouncing.
Beneficial Use	Any of the various uses of water, including, but not limited to, aquatic biota, recreation, water supply, wildlife habitat, and aesthetics, which are recognized in water quality standards.
Beneficial Use Reconnaissance Program (BURP)	A program for conducting systematic biological and physical habitat surveys of waterbodies in Idaho. BURP protocols address lakes, reservoirs, and wadeable streams and rivers
Benthic	Pertaining to or living on or in the bottom sediments of a waterbody
Benthic Organic Matter.	The organic matter on the bottom of a waterbody.
Benthos	Organisms living in and on the bottom sediments of lakes and streams. Originally, the term meant the lake bottom, but it is now applied almost uniformly to the animals associated with the lake and stream bottoms.
Best Management Practices (BMPs)	Structural, nonstructural, and managerial techniques that are effective and practical means to control nonpoint source pollutants.
Best Professional Judgment	A conclusion and/or interpretation derived by a trained and/or technically competent individual by applying interpretation and synthesizing information.
Biochemical Oxygen Demand (BOD)	The amount of dissolved oxygen used by organisms during the decomposition (respiration) of organic matter, expressed as mass of oxygen per volume of water, over some specified period of time.
Biological Integrity	1) The condition of an aquatic community inhabiting unimpaired waterbodies of a specified habitat as measured by an evaluation of multiple attributes of the aquatic biota (EPA 1996). 2) The ability of an aquatic ecosystem to support and maintain a balanced, integrated, adaptive community of organisms having a species composition, diversity, and functional organization comparable to the natural habitats of a region (Karr 1991).
Biomass	The weight of biological matter. Standing crop is the amount of biomass (e.g., fish or algae) in a body of water at a given time. Often expressed as grams per square meter.
Biota	The animal and plant life of a given region.
Biotic	A term applied to the living components of an area.

Clean Water Act (CWA)	The Federal Water Pollution Control Act (commonly known as the Clean Water Act), as last reauthorized by the Water Quality Act of 1987, establishes a process for states to use to develop information on, and control the quality of, the nation's water resources.
Coliform Bacteria	A group of bacteria predominantly inhabiting the intestines of humans and animals but also found in soil. Coliform bacteria are commonly used as indicators of the possible presence of pathogenic organisms (also see Fecal Coliform Bacteria).
Colluvium	Material transported to a site by gravity.
Community	A group of interacting organisms living together in a given place.
Conductivity	The ability of an aqueous solution to carry electric current, expressed in micro (µ) mhos/cm at 25 °C. Conductivity is affected by dissolved solids and is used as an indirect measure of total dissolved solids in a water sample.
Cretaceous	The final period of the Mesozoic era (after the Jurassic and before the Tertiary period of the Cenozoic era), thought to have covered the span of time between 135 and 65 million years ago.
Criteria	In the context of water quality, numeric or descriptive factors taken into account in setting standards for various pollutants. These factors are used to determine limits on allowable concentration levels, and to limit the number of violations per year. EPA develops criteria guidance; states establish criteria.
Cubic Feet per Second	A unit of measure for the rate of flow or discharge of water. One cubic foot per second is the rate of flow of a stream with a cross-section of one square foot flowing at a mean velocity of one foot per second. At a steady rate, once cubic foot per second is equal to 448.8 gallons per minute and 10,984 acre-feet per day.
Cultural Eutrophication	The process of eutrophication that has been accelerated by human-caused influences. Usually seen as an increase in nutrient loading (also see Eutrophication).
Culturally Induced Erosion	Erosion caused by increased runoff or wind action due to the work of humans in deforestation, cultivation of the land, overgrazing, and disturbance of natural drainages; the excess of erosion over the normal for an area (also see Erosion).
Debris Torrent	The sudden down slope movement of soil, rock, and vegetation on steep slopes, often caused by saturation from heavy rains.

Decomposition	The breakdown of organic molecules (e.g., sugar) to inorganic molecules (e.g., carbon dioxide and water) through biological and nonbiological processes.
Depth Fines	Percent by weight of particles of small size within a vertical core of volume of a streambed or lake bottom sediment. The upper size threshold for fine sediment for fisheries purposes varies from 0.8 to 6.5 mm depending on the observer and methodology used. The depth sampled varies but is typically about one foot (30 cm).
Designated Uses	Those water uses identified in state water quality standards that must be achieved and maintained as required under the Clean Water Act.
Discharge	The amount of water flowing in the stream channel at the time of measurement. Usually expressed as cubic feet per second (cfs).
Dissolved Oxygen (DO)	The oxygen dissolved in water. Adequate DO is vital to fish and other aquatic life.
Disturbance	Any event or series of events that disrupts ecosystem, community, or population structure and alters the physical environment.
E. coli	Short for *Escherichia Coli*, *E. coli* are a group of bacteria that are a subspecies of coliform bacteria. Most *E. coli* are essential to the healthy life of all warm-blooded animals, including humans. Their presence is often indicative of fecal contamination.
Ecology	The scientific study of relationships between organisms and their environment; also defined as the study of the structure and function of nature.
Ecological Indicator	A characteristic of an ecosystem that is related to, or derived from, a measure of a biotic or abiotic variable that can provide quantitative information on ecological structure and function. An indicator can contribute to a measure of integrity and sustainability. Ecological indicators are often used within the multimetric index framework.
Ecological Integrity	The condition of an unimpaired ecosystem as measured by combined chemical, physical (including habitat), and biological attributes (EPA 1996).
Ecosystem	The interacting system of a biological community and its non-living (abiotic) environmental surroundings.
Effluent	A discharge of untreated, partially treated, or treated wastewater into a receiving waterbody.
Endangered Species	Animals, birds, fish, plants, or other living organisms threatened with imminent extinction. Requirements for declaring a species as endangered are contained in the Endangered Species Act.

Environment	The complete range of external conditions, physical and biological, that affect a particular organism or community.
Eocene	An epoch of the early Tertiary period, after the Paleocene and before the Oligocene.
Eolian	Windblown, referring to the process of erosion, transport, and deposition of material by the wind.
Ephemeral Stream	A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long continued supply from melting snow or other sources. Its channel is at all times above the water table. (American Geologic Institute 1962).
Erosion	The wearing away of areas of the earth's surface by water, wind, ice, and other forces.
Eutrophic	From Greek for "well nourished," this describes a highly productive body of water in which nutrients do not limit algal growth. It is typified by high algal densities and low clarity.
Eutrophication	1) Natural process of maturing (aging) in a body of water. 2) The natural and human-influenced process of enrichment with nutrients, especially nitrogen and phosphorus, leading to an increased production of organic matter.
Exceedance	A violation (according to DEQ policy) of the pollutant levels permitted by water quality criteria.
Existing Beneficial Use or Existing Use	A beneficial use actually attained in waters on or after November 28, 1975, whether or not the use is designated for the waters in Idaho's *Water Quality Standards and Wastewater Treatment Requirements* (IDAPA 58.01.02).
Exotic Species	A species that is not native (indigenous) to a region.
Extrapolation	Estimation of unknown values by extending or projecting from known values.
Fauna	Animal life, especially the animals characteristic of a region, period, or special environment.
Fecal Coliform Bacteria	Bacteria found in the intestinal tracts of all warm-blooded animals or mammals. Their presence in water is an indicator of pollution and possible contamination by pathogens (also see Coliform Bacteria).
Fecal Streptococci	A species of spherical bacteria including pathogenic strains found in the intestines of warm-blooded animals.
Feedback Loop	In the context of watershed management planning, a feedback loop is a process that provides for tracking progress toward goals and revising actions according to that progress.
Fixed-Location Monitoring	Sampling or measuring environmental conditions continuously or repeatedly at the same location.

Flow	See Discharge.
Fluvial	In fisheries, this describes fish whose life history takes place entirely in streams but migrate to smaller streams for spawning.
Focal	Critical areas supporting a mosaic of high quality habitats that sustain a diverse or unusually productive complement of native species.
Fully Supporting	In compliance with water quality standards and within the range of biological reference conditions for all designated and exiting beneficial uses as determined through the *Water Body Assessment Guidance* (DEQ 2002).
Fully Supporting Cold Water	Reliable data indicate functioning, sustainable cold water biological assemblages (e.g., fish, macroinvertebrates, or algae), none of which have been modified significantly beyond the natural range of reference conditions (EPA 1997).
Fully Supporting but Threatened	An intermediate assessment category describing waterbodies that fully support beneficial uses, but have a declining trend in water quality conditions, which if not addressed, will lead to a "not fully supporting" status.
Geographical Information Systems (GIS)	A georeferenced database.
Geometric Mean	A back-transformed mean of the logarithmically transformed numbers often used to describe highly variable, right-skewed data (a few large values), such as bacterial data.
Grab Sample	A single sample collected at a particular time and place. It may represent the composition of the water in that water column.
Gradient	The slope of the land, water, or streambed surface.
Ground Water	Water found beneath the soil surface saturating the layer in which it is located. Most ground water originates as rainfall, is free to move under the influence of gravity, and usually emerges again as stream flow.
Growth Rate	A measure of how quickly something living will develop and grow, such as the amount of new plant or animal tissue produced per a given unit of time, or number of individuals added to a population.
Habitat	The living place of an organism or community.
Headwater	The origin or beginning of a stream.
Hydrologic Basin	The area of land drained by a river system, a reach of a river and its tributaries in that reach, a closed basin, or a group of streams forming a drainage area (also see Watershed).

Hydrologic Cycle	The cycling of water from the atmosphere to the earth (precipitation) and back to the atmosphere (evaporation and plant transpiration). Atmospheric moisture, clouds, rainfall, runoff, surface water, ground water, and water infiltrated in soils are all part of the hydrologic cycle.
Hydrologic Unit	One of a nested series of numbered and named watersheds arising from a national standardization of watershed delineation. The initial 1974 effort (USGS 1987) described four levels (region, subregion, accounting unit, cataloging unit) of watersheds throughout the United States. The fourth level is uniquely identified by an eight-digit code built of two-digit fields for each level in the classification. Originally termed a cataloging unit, fourth field hydrologic units have been more commonly called subbasins. Fifth and sixth field hydrologic units have since been delineated for much of the country and are known as watershed and sub-watersheds, respectively.
Hydrologic Unit Code (HUC)	The number assigned to a hydrologic unit. Often used to refer to fourth field hydrologic units.
Hydrology	The science dealing with the properties, distribution, and circulation of water.
Impervious	Describes a surface, such as pavement, that water cannot penetrate.
Influent	A tributary stream.
Inorganic	Materials not derived from biological sources.
Instantaneous	A condition or measurement at a moment (instant) in time.
Intergravel Dissolved Oxygen	The concentration of dissolved oxygen within spawning gravel. Consideration for determining spawning gravel includes species, water depth, velocity, and substrate.
Intermittent Stream	1) A stream that flows only part of the year, such as when the ground water table is high or when the stream receives water from springs or from surface sources such as melting snow in mountainous areas. The stream ceases to flow above the streambed when losses from evaporation or seepage exceed the available stream flow. 2) A stream that has a period of zero flow for at least one week during most years.
Interstate Waters	Waters that flow across or form part of state or international boundaries, including boundaries with Indian nations.
Irrigation Return Flow	Surface (and subsurface) water that leaves a field following the application of irrigation water and eventually flows into streams.

Key Watershed	A watershed that has been designated in Idaho Governor Batt's *State of Idaho Bull Trout Conservation Plan* (1996) as critical to the long-term persistence of regionally important trout populations.
Knickpoint	Any interruption or break of slope.
Land Application	A process or activity involving application of wastewater, surface water, or semi-liquid material to the land surface for the purpose of treatment, pollutant removal, or ground water recharge.
Limiting Factor	A chemical or physical condition that determines the growth potential of an organism. This can result in a complete inhibition of growth, but typically results in less than maximum growth rates.
Limnology	The scientific study of fresh water, especially the history, geology, biology, physics, and chemistry of lakes.
Load Allocation (LA)	A portion of a waterbody's load capacity for a given pollutant that is given to a particular nonpoint source (by class, type, or geographic area).
Load(ing)	The quantity of a substance entering a receiving stream, usually expressed in pounds or kilograms per day or tons per year. Loading is the product of flow (discharge) and concentration.
Loading Capacity (LC)	A determination of how much pollutant a waterbody can receive over a given period without causing violations of state water quality standards. Upon allocation to various sources, and a margin of safety, it becomes a total maximum daily load.
Loam	Refers to a soil with a texture resulting from a relative balance of sand, silt, and clay. This balance imparts many desirable characteristics for agricultural use.
Loess	A uniform wind-blown deposit of silty material. Silty soils are among the most highly erodible.
Lotic	An aquatic system with flowing water such as a brook, stream, or river where the net flow of water is from the headwaters to the mouth.
Luxury Consumption	A phenomenon in which sufficient nutrients are available in either the sediments or the water column of a waterbody, such that aquatic plants take up and store an abundance in excess of the plants' current needs.
Macroinvertebrate	An invertebrate animal (without a backbone) large enough to be seen without magnification and retained by a 500µm mesh (U.S. #30) screen.

Macrophytes	Rooted and floating vascular aquatic plants, commonly referred to as water weeds. These plants usually flower and bear seeds. Some forms, such as duckweed and coontail (*Ceratophyllum sp.*), are free-floating forms not rooted in sediment.
Margin of Safety (MOS)	An implicit or explicit portion of a waterbody's loading capacity set aside to allow the uncertainly about the relationship between the pollutant loads and the quality of the receiving waterbody. This is a required component of a total maximum daily load (TMDL) and is often incorporated into conservative assumptions used to develop the TMDL (generally within the calculations and/or models). The MOS is not allocated to any sources of pollution.
Mass Wasting	A general term for the down slope movement of soil and rock material under the direct influence of gravity.
Mean	Describes the central tendency of a set of numbers. The arithmetic mean (calculated by adding all items in a list, then dividing by the number of items) is the statistic most familiar to most people.
Median	The middle number in a sequence of numbers. If there are an even number of numbers, the median is the average of the two middle numbers. For example, 4 is the median of 1, 2, 4, 14, 16; and 6 is the median of 1, 2, 5, 7, 9, 11.
Metric	1) A discrete measure of something, such as an ecological indicator (e.g., number of distinct taxon). 2) The metric system of measurement.
Milligrams per liter (mg/L)	A unit of measure for concentration in water, essentially equivalent to parts per million (ppm).
Million gallons per day (MGD)	A unit of measure for the rate of discharge of water, often used to measure flow at wastewater treatment plants. One MGD is equal to 1.547 cubic feet per second.
Miocene	Of, relating to, or being an epoch of, the Tertiary between the Pliocene and the Oligocene periods, or the corresponding system of rocks.
Monitoring	A periodic or continuous measurement of the properties or conditions of some medium of interest, such as monitoring a waterbody.
Mouth	The location where flowing water enters into a larger waterbody.
National Pollution Discharge Elimination System (NPDES)	A national program established by the Clean Water Act for permitting point sources of pollution. Discharge of pollution from point sources is not allowed without a permit.
Natural Condition	A condition indistinguishable from that without human-caused disruptions.

Nitrogen	An element essential to plant growth, and thus is considered a nutrient.
Nodal	Areas that are separated from focal and adjunct habitats, but serve critical life history functions for individual native fish.
Nonpoint Source	A dispersed source of pollutants, generated from a geographical area when pollutants are dissolved or suspended in runoff and then delivered into waters of the state. Nonpoint sources are without a discernable point or origin. They include, but are not limited to, irrigated and non-irrigated lands used for grazing, crop production, and silviculture; rural roads; construction and mining sites; log storage or rafting; and recreation sites.
Not Assessed (NA)	A concept and an assessment category describing waterbodies that have been studied, but are missing critical information needed to complete an assessment.
Not Attainable	A concept and an assessment category describing waterbodies that demonstrate characteristics that make it unlikely that a beneficial use can be attained (e.g., a stream that is dry but designated for salmonid spawning).
Not Fully Supporting	Not in compliance with water quality standards or not within the range of biological reference conditions for any beneficial use as determined through the *Water Body Assessment Guidance* (DEQ 2002).
Not Fully Supporting Cold Water	At least one biological assemblage has been significantly modified beyond the natural range of its reference condition (EPA 1997).
Nuisance	Anything which is injurious to the public health or an obstruction to the free use, in the customary manner, of any waters of the state.
Nutrient	Any substance required by living things to grow. An element or its chemical forms essential to life, such as carbon, oxygen, nitrogen, and phosphorus. Commonly refers to those elements in short supply, such as nitrogen and phosphorus, which usually limit growth.
Nutrient Cycling	The flow of nutrients from one component of an ecosystem to another, as when macrophytes die and release nutrients that become available to algae (organic to inorganic phase and return).
Oligotrophic	The Greek term for "poorly nourished." This describes a body of water in which productivity is low and nutrients are limiting to algal growth, as typified by low algal density and high clarity.
Organic Matter	Compounds manufactured by plants and animals that contain principally carbon.

Orthophosphate	A form of soluble inorganic phosphorus most readily used for algal growth.
Oxygen-Demanding Materials	Those materials, mainly organic matter, in a waterbody that consume oxygen during decomposition.
Parameter	A variable, measurable property whose value is a determinant of the characteristics of a system, such as temperature, dissolved oxygen, and fish populations are parameters of a stream or lake.
Partitioning	The sharing of limited resources by different races or species; use of different parts of the habitat, or the same habitat at different times. Also the separation of a chemical into two or more phases, such as partitioning of phosphorus between the water column and sediment.
Pathogens	Disease-producing organisms (e.g., bacteria, viruses, parasites).
Perennial Stream	A stream that flows year-around in most years.
Periphyton	Attached microflora (algae and diatoms) growing on the bottom of a waterbody or on submerged substrates, including larger plants.
Pesticide	Substances or mixtures of substances intended for preventing, destroying, repelling, or mitigating any pest. Also, any substance or mixture intended for use as a plant regulator, defoliant, or desiccant.
pH	The negative $\log_{10}$ of the concentration of hydrogen ions, a measure which in water ranges from very acid (pH=1) to very alkaline (pH=14). A pH of 7 is neutral. Surface waters usually measure between pH 6 and 9.
Phased TMDL	A total maximum daily load (TMDL) that identifies interim load allocations and details further monitoring to gauge the success of management actions in achieving load reduction goals and the effect of actual load reductions on the water quality of a waterbody. Under a phased TMDL, a refinement of load allocations, wasteload allocations, and the margin of safety is planned at the outset.
Phosphorus	An element essential to plant growth, often in limited supply, and thus considered a nutrient.
Physiochemical	In the context of bioassessment, the term is commonly used to mean the physical and chemical factors of the water column that relate to aquatic biota. Examples in bioassessment usage include saturation of dissolved gases, temperature, pH, conductivity, dissolved or suspended solids, forms of nitrogen, and phosphorus. This term is used interchangeable with the terms “physical/chemical” and “physicochemical.”

Plankton	Microscopic algae (phytoplankton) and animals (zooplankton) that float freely in open water of lakes and oceans.
Point Source	A source of pollutants characterized by having a discrete conveyance, such as a pipe, ditch, or other identifiable “point” of discharge into a receiving water. Common point sources of pollution are industrial and municipal wastewater.
Pollutant	Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.
Pollution	A very broad concept that encompasses human-caused changes in the environment which alter the functioning of natural processes and produce undesirable environmental and health effects. This includes human-induced alteration of the physical, biological, chemical, and radiological integrity of water and other media.
Population	A group of interbreeding organisms occupying a particular space; the number of humans or other living creatures in a designated area.
Pretreatment	The reduction in the amount of pollutants, elimination of certain pollutants, or alteration of the nature of pollutant properties in wastewater prior to, or in lieu of, discharging or otherwise introducing such wastewater into a publicly owned wastewater treatment plant.
Primary Productivity	The rate at which algae and macrophytes fix carbon dioxide using light energy. Commonly measured as milligrams of carbon per square meter per hour.
Protocol	A series of formal steps for conducting a test or survey.
Qualitative	Descriptive of kind, type, or direction.
Quality Assurance (QA)	A program organized and designed to provide accurate and precise results. Included are the selection of proper technical methods, tests, or laboratory procedures; sample collection and preservation; the selection of limits; data evaluation; quality control; and personnel qualifications and training. The goal of QA is to assure the data provided are of the quality needed and claimed (Rand 1995, EPA 1996).
Quality Control (QC)	Routine application of specific actions required to provide information for the quality assurance program. Included are standardization, calibration, and replicate samples. QC is implemented at the field or bench level (Rand 1995, EPA 1996).
Quantitative	Descriptive of size, magnitude, or degree.
Reach	A stream section with fairly homogenous physical characteristics.

Reconnaissance	An exploratory or preliminary survey of an area.
Reference	A physical or chemical quantity whose value is known, and thus is used to calibrate or standardize instruments.
Reference Condition	1) A condition that fully supports applicable beneficial uses with little affect from human activity and represents the highest level of support attainable. 2) A benchmark for populations of aquatic ecosystems used to describe desired conditions in a biological assessment and acceptable or unacceptable departures from them. The reference condition can be determined through examining regional reference sites, historical conditions, quantitative models, and expert judgment (Hughes 1995).
Reference Site	A specific locality on a waterbody that is minimally impaired and is representative of reference conditions for similar waterbodies.
Representative Sample	A portion of material or water that is as similar in content and consistency as possible to that in the larger body of material or water being sampled.
Resident	A term that describes fish that do not migrate.
Respiration	A process by which organic matter is oxidized by organisms, including plants, animals, and bacteria. The process converts organic matter to energy, carbon dioxide, water, and lesser constituents.
Riffle	A relatively shallow, gravelly area of a streambed with a locally fast current, recognized by surface choppiness. Also an area of higher streambed gradient and roughness.
Riparian	Associated with aquatic (stream, river, lake) habitats. Living or located on the bank of a waterbody.
Riparian Habitat Conservation Area (RHCA)	A U.S. Forest Service description of land within the following number of feet up-slope of each of the banks of streams: - 300 feet from perennial fish-bearing streams - 150 feet from perennial non-fish-bearing streams - 100 feet from intermittent streams, wetlands, and ponds in priority watersheds.
River	A large, natural, or human-modified stream that flows in a defined course or channel, or a series of diverging and converging channels.
Runoff	The portion of rainfall, melted snow, or irrigation water that flows across the surface, through shallow underground zones (interflow), and through ground water to creates streams.
Sediments	Deposits of fragmented materials from weathered rocks and organic material that were suspended in, transported by, and eventually deposited by water or air.

Settleable Solids	The volume of material that settles out of one liter of water in one hour.
Species	1) A reproductively isolated aggregate of interbreeding organisms having common attributes and usually designated by a common name. 2) An organism belonging to such a category.
Spring	Ground water seeping out of the earth where the water table intersects the ground surface.
Stagnation	The absence of mixing in a waterbody.
Stenothermal	Unable to tolerate a wide temperature range.
Stratification	A Department of Environmental Quality classification method used to characterize comparable units (also called classes or strata).
Stream	A natural water course containing flowing water, at least part of the year. Together with dissolved and suspended materials, a stream normally supports communities of plants and animals within the channel and the riparian vegetation zone.
Stream Order	Hierarchical ordering of streams based on the degree of branching. A first-order stream is an unforked or unbranched stream. Under Strahler's (1957) system, higher order streams result from the joining of two streams of the same order.
Storm Water Runoff	Rainfall that quickly runs off the land after a storm. In developed watersheds the water flows off roofs and pavement into storm drains that may feed quickly and directly into the stream. The water often carries pollutants picked up from these surfaces.
Stressors	Physical, chemical, or biological entities that can induce adverse effects on ecosystems or human health.
Subbasin	A large watershed of several hundred thousand acres. This is the name commonly given to 4th field hydrologic units (also see Hydrologic Unit).
Subbasin Assessment (SBA)	A watershed-based problem assessment that is the first step in developing a total maximum daily load in Idaho.
Sub-watershed	A smaller watershed area delineated within a larger watershed, often for purposes of describing and managing localized conditions. Also proposed for adoption as the formal name for 6th field hydrologic units.
Surface Fines	Sediments of small size deposited on the surface of a streambed or lake bottom. The upper size threshold for fine sediment for fisheries purposes varies from 0.8 to 605 mm depending on the observer and methodology used. Results are typically expressed as a percentage of observation points with fine sediment.

Surface Runoff	Precipitation, snow melt, or irrigation water in excess of what can infiltrate the soil surface and be stored in small surface depressions; a major transporter of nonpoint source pollutants in rivers, streams, and lakes. Surface runoff is also called overland flow.
Surface Water	All water naturally open to the atmosphere (rivers, lakes, reservoirs, streams, impoundments, seas, estuaries, etc.) and all springs, wells, or other collectors that are directly influenced by surface water.
Suspended Sediments	Fine material (usually sand size or smaller) that remains suspended by turbulence in the water column until deposited in areas of weaker current. These sediments cause turbidity and, when deposited, reduce living space within streambed gravels and can cover fish eggs or alevins.
Taxon	Any formal taxonomic unit or category of organisms (e.g., species, genus, family, order). The plural of taxon is taxa (Armantrout 1998).
Tertiary	An interval of geologic time lasting from 66.4 to 1.6 million years ago. It constitutes the first of two periods of the Cenozoic Era, the second being the Quaternary. The Tertiary has five subdivisions, which from oldest to youngest are the Paleocene, Eocene, Oligocene, Miocene, and Pliocene epochs.
Thalweg	The center of a stream's current, where most of the water flows.
Threatened Species	Species, determined by the U.S. Fish and Wildlife Service, which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range.
Total Maximum Daily Load (TMDL)	A TMDL is a waterbody's loading capacity after it has been allocated among pollutant sources. It can be expressed on a time basis other than daily if appropriate. Sediment loads, for example, are often calculated on an annual bases. TMDL = Loading Capacity = Load Allocation + Wasteload Allocation + Margin of Safety. In common usage, a TMDL also refers to the written document that contains the statement of loads and supporting analyses, often incorporating TMDLs for several waterbodies and/or pollutants within a given watershed.
Total Dissolved Solids	Dry weight of all material in solution in a water sample as determined by evaporating and drying filtrate.

Total Suspended Solids (TSS) The dry weight of material retained on a filter after filtration. Filter pore size and drying temperature can vary. American Public Health Association Standard Methods (Greenborg, Clescevi, and Eaton 1995) call for using a filter of 2.0 micron or smaller; a 0.45 micron filter is also often used. This method calls for drying at a temperature of 103-105 °C.

Toxic Pollutants Materials that cause death, disease, or birth defects in organisms that ingest or absorb them. The quantities and exposures necessary to cause these effects can vary widely.

Tributary A stream feeding into a larger stream or lake.

Trophic State The level of growth or productivity of a lake as measured by phosphorus content, chlorophyll *a* concentrations, amount (biomass) of aquatic vegetation, algal abundance, and water clarity.

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Turbidity A measure of the extent to which light passing through water is scattered by fine suspended materials. The effect of turbidity depends on the size of the particles (the finer the particles, the greater the effect per unit weight) and the color of the particles.

Vadose Zone The unsaturated region from the soil surface to the ground water table.

Wasteload Allocation (WLA) The portion of receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution. Wasteload allocations specify how much pollutant each point source may release to a waterbody.

Waterbody	A stream, river, lake, estuary, coastline, or other water feature, or portion thereof.
Water Column	Water between the interface with the air at the surface and the interface with the sediment layer at the bottom. The idea derives from a vertical series of measurements (oxygen, temperature, phosphorus) used to characterize water.
Water Pollution	Any alteration of the physical, thermal, chemical, biological, or radioactive properties of any waters of the state, or the discharge of any pollutant into the waters of the state, which will or is likely to create a nuisance or to render such waters harmful, detrimental, or injurious to public health, safety, or welfare; to fish and wildlife; or to domestic, commercial, industrial, recreational, aesthetic, or other beneficial uses.
Water Quality	A term used to describe the biological, chemical, and physical characteristics of water with respect to its suitability for a beneficial use.
Water Quality Criteria	Levels of water quality expected to render a body of water suitable for its designated uses. Criteria are based on specific levels of pollutants that would make the water harmful if used for drinking, swimming, farming, or industrial processes.
Water Quality Limited	A label that describes waterbodies for which one or more water quality criterion is not met or beneficial uses are not fully supported. Water quality limited segments may or may not be on a §303(d) list.
Water Quality Limited Segment (WQLS)	Any segment placed on a state's §303(d) list for failure to meet applicable water quality standards, and/or is not expected to meet applicable water quality standards in the period prior to the next list. These segments are also referred to as "§303(d) listed."
Water Quality Management Plan	A state or area-wide waste treatment management plan developed and updated in accordance with the provisions of the Clean Water Act.
Water Quality Modeling	The prediction of the response of some characteristics of lake or stream water based on mathematical relations of input variables such as climate, stream flow, and inflow water quality.
Water Quality Standards	State-adopted and EPA-approved ambient standards for waterbodies. The standards prescribe the use of the waterbody and establish the water quality criteria that must be met to protect designated uses.
Water Table	The upper surface of ground water; below this point, the soil is saturated with water.

Watershed	1) All the land which contributes runoff to a common point in a drainage network, or to a lake outlet. Watersheds are infinitely nested, and any large watershed is composed of smaller "sub-watersheds." 2) The whole geographic region which contributes water to a point of interest in a waterbody.
Waterbody Identification Number (WBID)	A number that uniquely identifies a waterbody in Idaho ties in to the Idaho Water Quality Standards and GIS information.
Wetland	An area that is at least some of the time saturated by surface or ground water so as to support with vegetation adapted to saturated soil conditions. Examples include swamps, bogs, fens, and marshes.
Young of the Year	Young fish born the year captured, evidence of spawning activity.

Appendix A. SNOTEL Snow Water Content Graphs

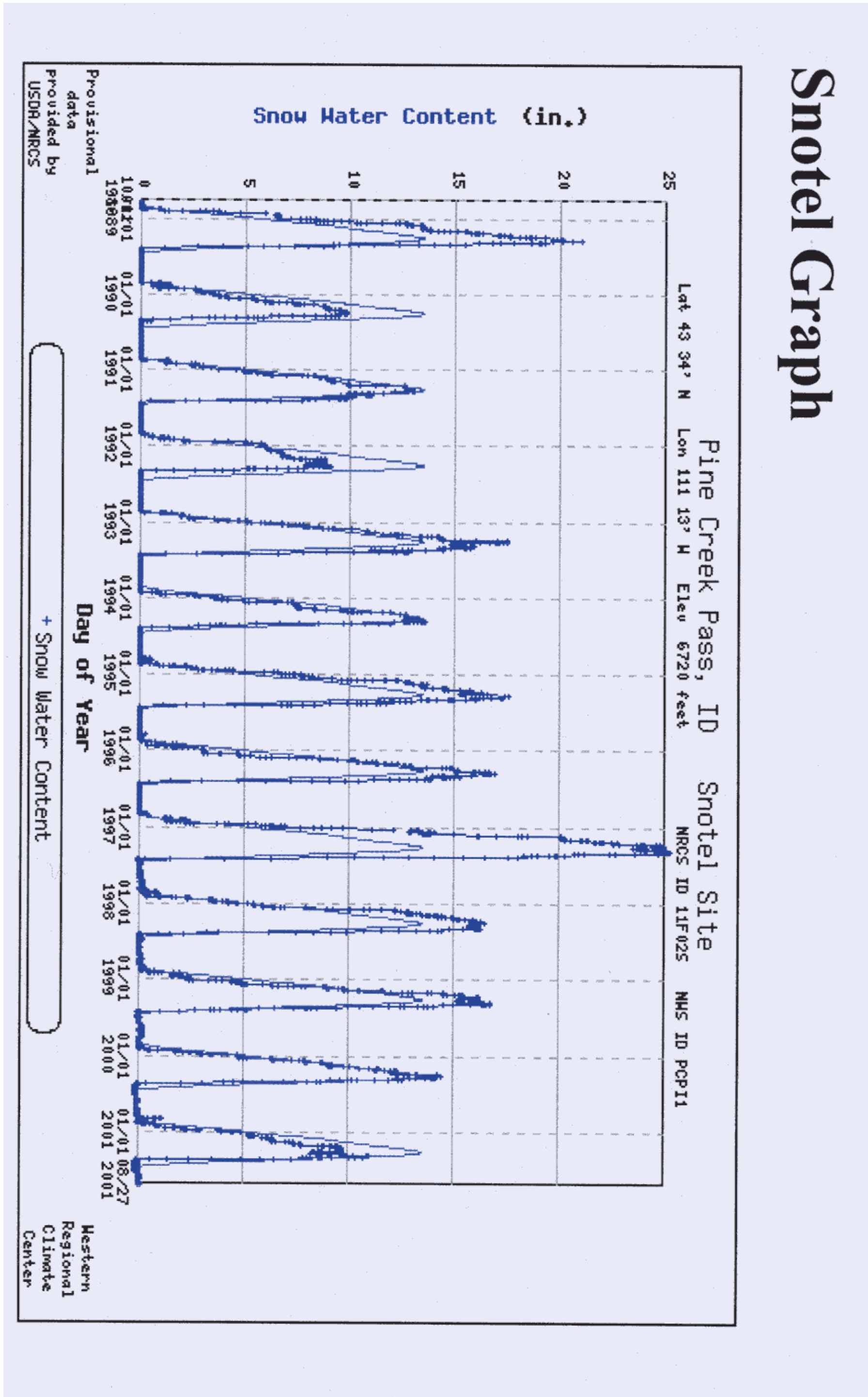

Figure A-1. Snotel Graph for Pine Creek Pass, ID.

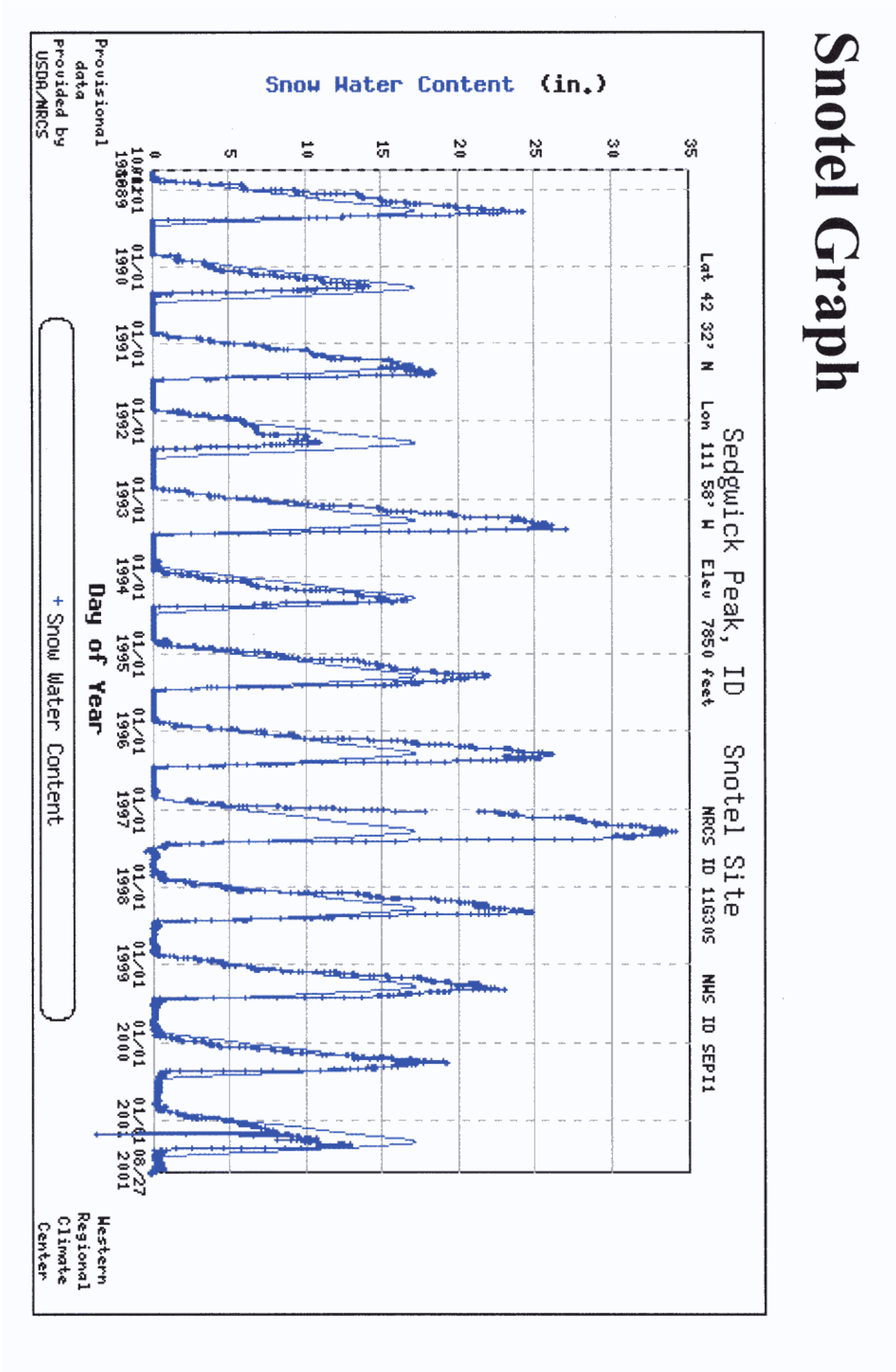

Figure A-2. Snotel Graph for Sedgewick Peak, ID.

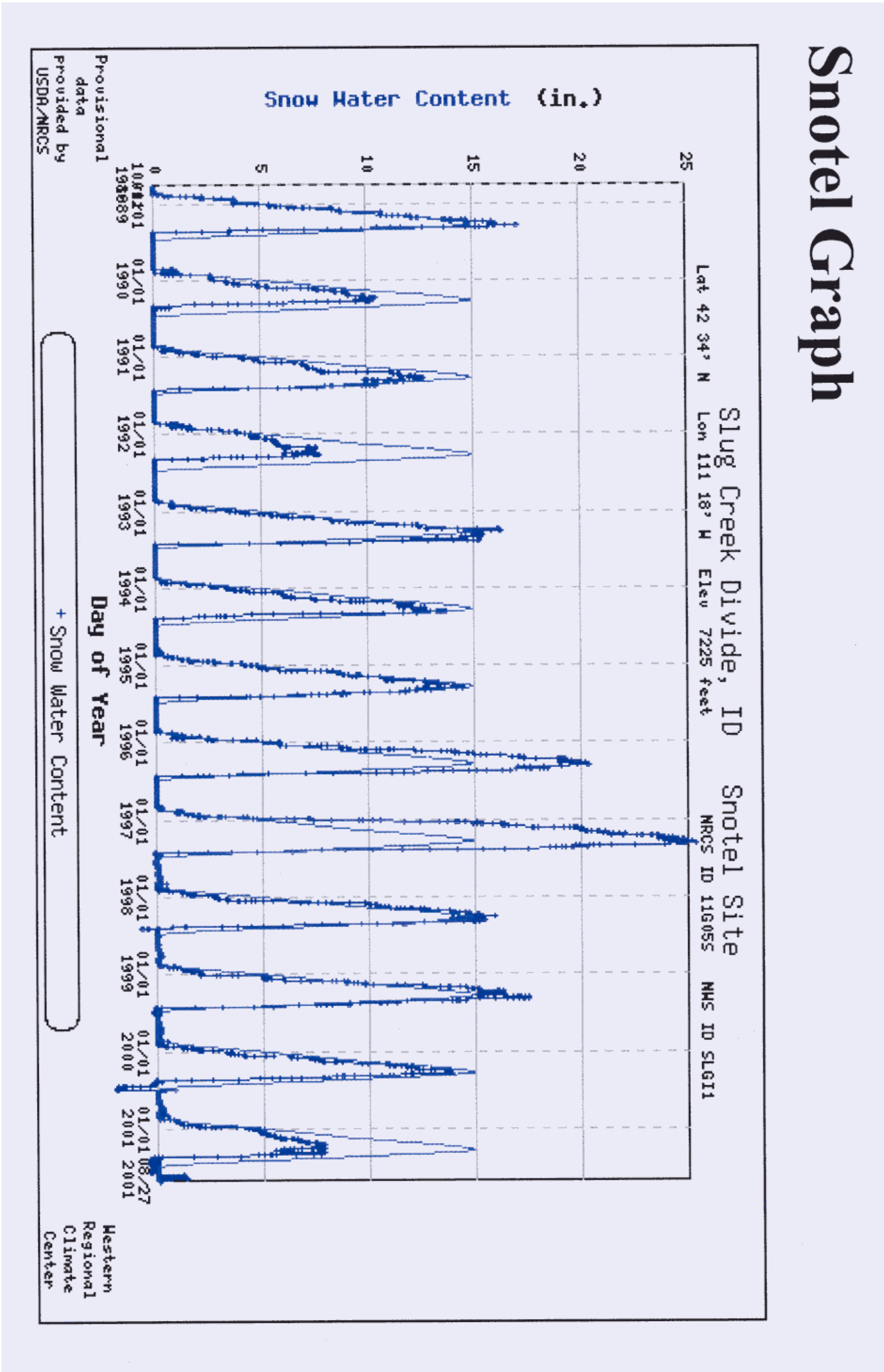

Figure A-3. Snotel Graph for Slug Creek Divide, ID.

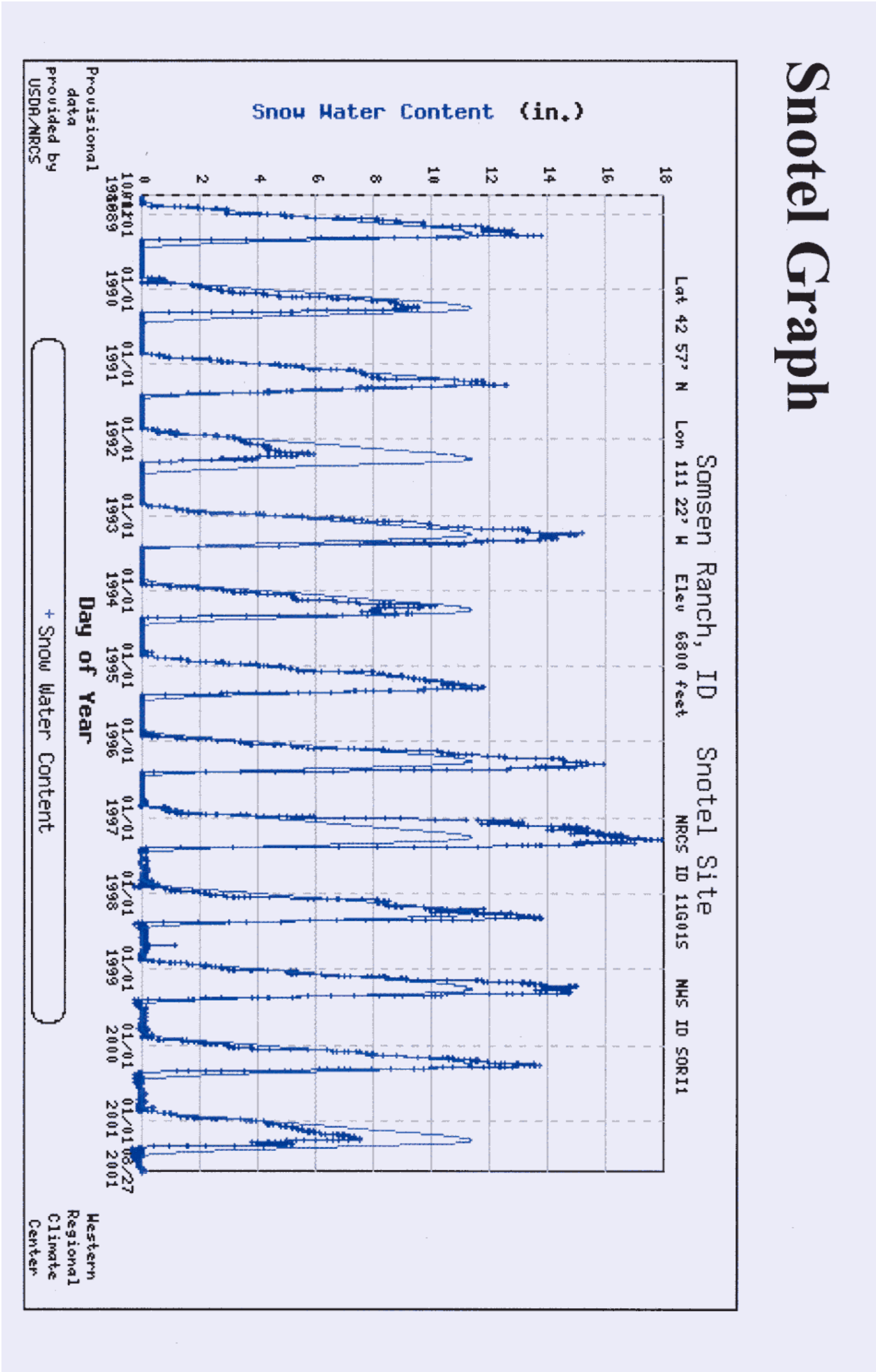

Figure A-4. Snotel Graph for Somsen Ranch, ID.

Appendix B. Stream Characteristics from BURP field data.

Table B-1. Stream Characteristics from BURP field data.

Stream Name	BURP Site ID #	Elevation (ft)	Rosgen Channel Type	Valley Type	Sinuosity	Stream Order	Stream Gradient (%)	% Fines	Width/Depth Ratio
Birch Creek	96-Z041	6120	B	U-Shaped	Moderate	2	3.0	84	15.9
	01-A036*	5920	F	Trough-Like	Low	2	1.5	34	52.6
	96-Z038*	5900	B	U-Shaped	Moderate	2	1.0	71	17.2
	96-Z037	5640	B	Trough-Like	Moderate	2	3.0	97	7.6
Brockman Creek	98-C002	6590	E	V-Shaped	Moderate	1	1.0	80	6.2
	94-17	6420	C	Trough-Like	Moderate	2	2.0	27	11.2
	94-18	6180	C	Trough-Like	Moderate	2	1.0	24	12.7
Bridge Creek	98-D001	6520	G	U-Shaped	Moderate	1	1.5	82	2.7
Buck Creek	96-Y002*	6360	C	U-Shaped	Moderate	1	1.0	70	9.7
	01-A042*	6360	E	Trough-Like	Moderate	1	1.0	74	25.6
Bulls Fork Creek	97-M001	6320	E	U-Shaped	Moderate	2	1.0	99	4.5
	97-L001	5950	F	U-Shaped	Moderate	2	0.5	93	3.2
Canyon Creek	97-L010	6050	C	U-Shaped	Low	1	1.0	83	6.6
Cattle Creek	97-L006	6140	F	Trough-Like	Low	1	1.0	100	15
Clark Creek	97-M007	6440	D	Trough-Like	Braided	2	2.0	75	6.3
Corral Creek	95-A019	6680	C	Trough-Like	High	2	2.0	38	10.8
	01-A039*	6360	E	Trough-Like	Moderate	2	2.0	38	20.7
	94-84*	6360	F	Trough-Like	High	2	2.0	27	17.4
Crane Creek	98-D009	6440	E	Trough-Like	High	1	1.5	89	5.6
	97-M006	6480	E	Trough-Like	High	2	1.2	100	48.3
	97-M005	6335	E	Trough- Like	Moderate	3	1.5	34	24.2
Dan Creek	98-C001	6700	E	U-Shaped	Moderate	1	2.0	84	8.4
	96-Y126	6000	G	Trough-Like	Moderate	2	2.0	87	8.2
Deep Creek	97-L004	5245	B	V-Shaped	Moderate	2	4.0	83	6.4
Eagle Creek North Fork	98-D002	6740	C	U-Shaped	Moderate	2	2.5	38	8.1
Gravel Creek	98-D007	6615	C	U-Shaped	Moderate	1	2.0	56	10.3
	98-D008	6596	B	U-Shaped	Moderate	2	2.0	43	6.4
Grays Lake Outlet	97-M140	6375	C	Trough-Like	Moderate	3	0.3	71	47.6
	97-M141	5960	B	Flat Bottomed	Moderate	3	2.5	26	15.8
	95-B073	5600	B	Trough-Like	Moderate	3	3.5	25	16
	95-B069	5560	B	Trough-Like	Moderate	4	2.5	28	25.7
Hell Creek	94-14	6600		Trough-Like	Moderate	1	3.0	69	20.3
	95-A001	5880	B	Trough-Like	Moderate	3	4.0	42	13.2
	95-A002	5600	B	Trough-Like	Moderate	3	4.5	42	9.7
Homer Creek	95-A018	6000	B	Trough-Like	Moderate	2		22	11.2
Indian Fork Creek	97-M002	5820	E	U-Shaped	Moderate	2	0.9	100	4.3
Lava Creek	94-81	6680	F	Trough-Like	Moderate	1	1.0	32	32.3
	01-A040	6320	C	Trough-Like	Moderate	2	1.0	20	18.2
	94-82	6140	C	Trough-Like	Moderate	2	2.0	12	33.3
Long Valley Creek	97-L008	6225	F	Trough-Like	Moderate	1	1.0	100	7.4

	97-L007	6125	D	Flat Bottomed	Braided	2	1.0	97	9.5
Meadow Creek	98-D005	6180	G	V-Shaped	High	1	2.5	67	3.56
	95-A004	6100	B	Flat Bottomed	Moderate	2	2.5	67	3.7
	96-Z001	5850	B	U-Shaped	Moderate	2	2.0	90	6.4
	96-Y001	5640	B	V-Shaped	Moderate	2	2.0	57	4.5
	95-B002	5240	C	Flat Bottomed	Moderate	2	1.0	92	3.3
Mill Creek	01-A0401	6360	E	U-Shaped	High	2	2.2	50	24.9
	95-B016	6540	C	Trough-Like	High	1	1.1	62	7.7
	95-B014	6320		Trough-Like	High	2	1.9	39	17.6
Mud Creek	97-L009	6540	C	Trough-Like	Moderate	2	1.0	100	4
Mud Spring Creek	98-C003	5560	B	Trough-Like	Low	1	2.5	82	3.5
	97-L003	5250	A	V-Shaped	Low	2	8	69	7.4
Pipe Creek	98-D013	5940	F	U-Shaped	Low	1	2.5	84	11.9
	97-L002	5805	F	Trough-Like	Low	2	1.0	99	3.5
Rock Creek	97-L012	5950	B	U-Shaped	Low	1	2.0	100	8.3
Sawmill Creek	94-15	6480	B	Trough-Like	Moderate	2	3.0	66	44.3
	94-16	6360	B	Trough-Like	High	2	3.0	10	20.9
Sellars Creek	96-Z003	6600	A	U-Shaped	Moderate	1	4.5	96	6.1
	01-A034	6360	C	U-Shaped	Moderate	3	1.0	35	18
	95-B023	6120	C	Flat Bottomed	Moderate	2	1.0	32	19.5
Seventy Creek	95-B015	6640	C	Trough-Like	Moderate	1	1.9	89	8.3
	95-B013	6350	B	Trough-Like	Moderate	2	2.0	49	9.6
Shirley Creek	98-D004	6260	E	U-Shaped	High	2	1.3	51	11.8
Squaw Creek	96-Z039	6220	C	Trough-Like	Moderate	1	1.0	71	9
	96-Z040	6200	B	U-Shaped	Moderate	2	3.0	78	13.9
	01-A035	5720	G	Trough-Like	Low	2	1.0	60	18
Tex Creek	95-A107*	6000	B	Trough-Like	Moderate	3	3.0	52	15.7
	95-A003*	5940	B	Flat Bottomed	Moderate	3	2.0	42	9.5
	95-A106*	5540	B	Flat Bottomed	Moderate	3	3.0	32	24
	95-B001*	5540	C	Flat Bottomed	Moderate	3	2.0	54	7.1
Willow Creek2	97-M008*	6755	B	V-Shaped	Moderate	2	3.0	52	6.9
	98-D003*	6760	C	U-Shaped	Moderate	1	4.0	47	10.1
Willow Creek	97-M004	6525	E	Trough	Moderate	1	1.0	97	10.5
	01-A100*	6200	B	Box Canyon	Low	4	1.5	6	22.1
	97-M003*	6200	B	Box Canyon	Low	4	1.5	52	18.1
	95-B072	5900	B	Trough-Like	Low	4	4.0	20	66.4
	95-B068	5480	B	Trough-Like	Moderate	5	2.0	34	39.6
	95-B049	5300	C	Trough-Like	Moderate	5	1.5	28	19

*= In indicates same approximate location on a different year.

Appendix C. Unit Conversion Chart

Table C-1. Metric - English unit conversions.

	English Units	Metric Units	To Convert	Example
Distance	Miles (mi)	Kilometers (km)	1 mi = 1.61 km 1 km = 0.62 mi	3 mi = 4.83 km 3 km = 1.86 mi
Length	Inches (in) Feet (ft)	Centimeters (cm) Meters (m)	1 in = 2.54 cm 1 cm = 0.39 in 1 ft = 0.30 m 1 m = 3.28 ft	3 in = 7.62 cm 3 cm = 1.18 in 3 ft = 0.91 m 3 m = 9.84 ft
Area	Acres (ac) Square Feet (ft^2) Square Miles (mi^2)	Hectares (ha) Square Meters (m^2) Square Kilometers (km^2)	1 ac = 0.40 ha 1 ha = 2.47 ac 1 ft^2 = 0.09 m^2 1 m^2 = 10.76 ft^2 1 mi^2 = 2.59 km^2 1 km^2 = 0.39 mi^2	3 ac = 1.20 ha 3 ha = 7.41 ac 3 ft^2 = 0.28 m^2 3 m^2 = 32.29 ft^2 3 mi^2 = 7.77 km^2 3 km^2 = 1.16 mi^2
Volume	Gallons (g) Cubic Feet (ft^3)	Liters (L) Cubic Meters (m^3)	1 g = 3.78 l 1 l = 0.26 g 1 ft^3 = 0.03 m^3 1 m^3 = 35.32 ft^3	3 g = 11.35 l 3 l = 0.79 g 3 ft^3 = 0.09 m^3 3 m^3 = 105.94 ft^3
Flow Rate	Cubic Feet per Second (ft^3/sec)[1]	Cubic Meters per Second (m^3/sec)	1 ft^3/sec = 0.03 m^3/sec 1 m^3/sec = ft^3/sec	3 ft^3/sec = 0.09 m^3/sec 3 m^3/sec = 105.94 ft^3/sec
Concentration	Parts per Million (ppm)	Milligrams per Liter (mg/L)	1 ppm = 1 mg/L[2]	3 ppm = 3 mg/L
Weight	Pounds (lbs)	Kilograms (kg)	1 lb = 0.45 kg 1 kg = 2.20 lbs	3 lb = 1.36 kg 3 kg = 6.61 kg
Temperature	Fahrenheit (°F)	Celsius (°C)	°C = 0.55 (F - 32) °F = (C x 1.8) + 32	3 °F = -15.95 °C 3 ° C = 37.4 °F

[1] 1 ft^3/sec = 0.65 million gallons per day; 1 million gallons per day is equal to 1.55 ft^3/sec.
[2]The ratio of 1 ppm = 1 mg/L is approximate and is only accurate for water

Appendix D. State and Site-Specific Standards and Criteria

003. DEFINITIONS.

For the purpose of the rules contained in IDAPA 58.01.02, "Water Quality Standards and Wastewater Treatment Requirements," the following definitions apply: (4-5-00)

01. Acute. Involving a stimulus severe enough to rapidly induce a response; in aquatic toxicity tests, a response measuring lethality observed in ninety-six (96) hours or less is typically considered acute. When referring to human health, an acute effect is not always measured in terms of lethality. (3-20-97)

02. Acute Criteria. Unless otherwise specified in these rules, the maximum instantaneous or one (1) hour average concentration of a toxic substance or effluent which ensures adequate protection of sensitive species of aquatic organisms from acute toxicity resulting from exposure to the toxic substance or effluent. Acute criteria will adequately protect the designated aquatic life use if not exceeded more than once every three (3) years. The terms "acute criteria" and "criterion maximum concentration" (CMC) are equivalent. (3-15-02)

03. Acute Toxicity. The existence of mortality or injury to aquatic organisms resulting from a single or short-term (i.e., ninety-six (96) hours or less) exposure to a substance. As applied to toxicity tests, acute toxicity refers to the response of aquatic test organisms to a concentration of a toxic substance or effluent which results in a LC-50. (3-20-97)

04. Beneficial Use. Any of the various uses which may be made of the water of Idaho, including, but not limited to, domestic water supplies, industrial water supplies, agricultural water supplies, navigation, recreation in and on the water, wildlife habitat, and aesthetics. The beneficial use is dependent upon actual use, the ability of the water to support a non-existing use either now or in the future, and its likelihood of being used in a given manner. The use of water for the purpose of wastewater dilution or as a receiving water for a waste treatment facility effluent is not a beneficial use. (8-24-94)

05. Available. Based on public wastewater system size, complexity, and variation in raw waste, a certified wastewater operator must be on site or able to be contacted as needed to initiate the appropriate action for

050. ADMINISTRATIVE POLICY.

01. Apportionment Of Water. The adoption of water quality standards and the enforcement of such standards is not intended to conflict with the apportionment of water to the state through any of the interstate compacts or court decrees, or to interfere with the rights of Idaho appropriators, either now or in the future, in the utilization of the water appropriations which have been granted to them under the statutory procedure, or to interfere with water quality criteria established by mutual agreement of the participants in interstate water pollution control enforcement procedures. (7-1-93)

02. Protection Of Waters Of The State. (7-1-93)

a. Wherever attainable, surface waters of the state shall be protected for beneficial uses which for surface waters includes all recreational use in and on the water surface and the preservation and propagation of desirable species of aquatic life; (4-5-00)

b. In all cases, existing beneficial uses of the waters of the state will be protected. (7-1-93)

03. Annual Program. To fully achieve and maintain water quality in the state, it is the intent of the Department to develop and implement a Continuing Planning Process that describes the on-going planning requirements of the State's Water Quality Management Plan. The Department's planned programs for water pollution control comprise the State's Water Quality Management Plan. (4-5-00)

04. Program Integration. Whenever an activity or class of activities is subject to provisions of these rules, as well as other regulations or standards of either this Department or other Governmental agency, the Department will seek and employ those methods necessary and practicable to integrate the implementation, administration and enforcement of all applicable regulations through a single program. Integration will not, however, be affected to the extent that applicable provisions of these rules would fail to be achieved or maintained unless the Department's role in these cases is limited by state statute or federal law. (7-1-93)

05. Revisions. These rules are subject to amendment as technical data, surveillance programs, and technological advances require. Any revisions made to these rules shall be in accordance with Sections 39-101, et seq., and 67-5201, et seq., Idaho Code. (8-24-94)

053. BENEFICIAL USE SUPPORT STATUS.
In determining whether a water body fully supports designated and existing beneficial uses, the Department shall determine whether all of the applicable water quality standards are being achieved, including any criteria developed pursuant to these rules, and whether a healthy, balanced biological community is present. The Department shall utilize biological and aquatic habitat parameters listed below and in the current version of the "Water Body Assessment Guidance", as published by the Idaho Department of Environmental Quality, as a guide to assist in the assessment of beneficial use status. Revisions to this guidance will made after notice and an opportunity for public comment. These parameters are not to be considered or treated as individual water quality criteria or otherwise interpreted or applied as water quality standards. (4-5-00)

01. Aquatic Habitat Parameters. These parameters may include, but are not limited to, stream width, stream depth, stream shade, measurements of sediment impacts, bank stability, water flows, and other physical characteristics of the stream that affect habitat for fish, macroinvertebrates or other aquatic life; and (3-20-97)

02. Biological Parameters. These parameters may include, but are not limited to, evaluation of aquatic macroinvertebrates including Ephemeroptera, Plecoptera and Trichoptera (EPT), Hilsenhoff Biotic Index, measures of functional feeding groups, and the variety and number of fish or other aquatic life to determine biological community diversity and functionality. (3-20-97)

03. Outstanding Resource Waters. Where high quality waters constitute an outstanding national resource, such as waters of national and state parks and wildlife refuges and waters of exceptional recreational or ecological significance, that water quality shall be maintained and protected from the impacts of point and nonpoint source activities. (3-20-97)

051. ANTIDEGRADATION POLICY.

01. Maintenance Of Existing Uses For All Waters. The existing in stream water uses and the level of water quality necessary to protect the existing uses shall be maintained and protected. (7-1-93)

02. High Quality Waters. Where the quality of the waters exceeds levels necessary to support propagation of fish, shellfish and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the Department finds, after full satisfaction of the intergovernmental coordination and public participation provisions of the Department's continuing planning process, that allowing lower water quality is necessary to accommodate important economic or social development in the area in which the waters are located. In allowing such degradation or lower water quality, the Department shall assure water quality adequate to protect existing uses fully. Further, the Department shall assure that there shall be achieved the highest statutory and regulatory requirements for all new and existing point sources and cost-effective and reasonable best management practices for nonpoint source control. In providing such assurance, the Department may enter together into an agreement with other state of Idaho or federal agencies in accordance with Sections 67-2326 through 67-2333, Idaho Code. (7-1-93)

100. SURFACE WATER USE DESIGNATIONS.

Waterbodies are designated in Idaho to protect water quality for existing or designated uses. The designated use of a waterbody does not imply any rights to access or ability to conduct any activity related to the use designtion, nor does it imply that an activity is safe. For example, a designation of primary or secondary contact recreation may occur in areas where it is unsafe to enter the water due to water flows, depth or other hazardous conditions. Another example is that aquatic life uses may be designated in areas that are closed to fishing or access is not allowed by property owners. Wherever attainable, the designated beneficial uses for which the surface waters of the state are to be protected include: (3-15-02)

01. Aquatic Life. (7-1-93)

a. Cold water (COLD): water quality appropriate for the protection and maintenance of a viable aquatic life community for cold water species. (4-5-00)

b. Salmonid spawning: waters which provide or could provide a habitat for active self-propagating populations of salmonid fishes. (7-1-93)

c. Seasonal cold water (SC): water quality appropriate for the protection and maintenance of a viable aquatic life community of cool and cold water species, where cold water aquatic life may be absent during, or tolerant of, seasonally warm temperatures. (4-5-00)

d. Warm water (WARM): water quality appropriate for the protection and maintenance of a viable aquatic life community for warm water species. (4-5-00)

e. Modified (MOD): water quality appropriate for an aquatic life community that is limited due to one (1) or more conditions set forth in 40 CFR 131.10(g) which preclude attainment of reference streams or conditions. (4-5-00)

02. Recreation. (7-1-93)

a. Primary contact recreation (PCR): water quality appropriate for prolonged and intimate contact by humans or for recreational activities when the ingestion of small quantities of water is likely to occur. Such activities include, but are not restricted to, those used for swimming, water skiing, or skin diving. (4-5-00)

b. Secondary contact recreation (SCR): water quality appropriate for recreational uses on or about the water and which are not included in the primary contact category. These activities may include fishing, boating, wading, infrequent swimming, and other activities where ingestion of raw water is not likely to occur. (4-5-00)

03. Water Supply. (7-1-93)

a. Domestic: water quality appropriate for drinking water supplies. (4-5-00)

b. Agricultural: water quality appropriate for the irrigation of crops or as drinking water for livestock. This use applies to all surface waters of the state. (4-5-00)

c. Industrial: water quality appropriate for industrial water supplies. This use applies to all surface waters of the state. (4-5-00)

04. Wildlife Habitats. Water quality appropriate for wildlife habitats. This use applies to all surface waters of the state. (4-5-00)

05. Aesthetics. This use applies to all surface waters of the state. (7-1-93)

101. NONDESIGNATED SURFACE WATERS.

01. Undesignated Surface Waters. Surface waters not designated in Sections 110 through 160 shall be designated according to Section 39-3604, Idaho Code, taking into consideration the use of the surface water and such physical, geological, chemical, and biological measures as may affect the surface water. Prior to designation, undesignated waters shall be protected for beneficial uses, which includes all recreational use in and on the water and the protection and propagation of fish, shellfish, and wildlife, wherever attainable. (3-23-98)

a. Because the Department presumes most waters in the state will support cold water aquatic life and primary or secondary contact recreation beneficial uses, the Department will apply cold water aquatic life and primary or secondary contact recreation criteria to undesignated waters unless Sections 101.01.b and 101.01c. are followed. (4-5-00)

b. During the review of any new or existing activity on an undesignated water, the Department may examine all relevant data or may require the gathering of relevant data on beneficial uses; pending determination in Section 101.01.c. existing activities will be allowed to continue. (3-23-98)

c. If, after review and public notice of relevant data, it is determined that beneficial uses in addition to or other than cold water aquatic life and primary or secondary contact recreation are appropriate, then the Department will: (4-5-00)

i. Complete the review and compliance determination of the activity in context with the new information on beneficial uses, and (3-23-98)

ii. Initiate rulemaking necessary to designate the undesignated water, including providing all necessary data and information to support the proposed designation. (3-23-98)

02. Man-Made Waterways. Unless designated in Sections 110 through 160, man-made waterways are to be protected for the use for which they were developed. (7-1-93)

03. Private Waters. Unless designated in Sections 110 through 160, lakes, ponds, pools, streams and springs outside public lands but located wholly and entirely upon a person's land are not protected specifically or generally for any beneficial use. (7-1-93)

250. SURFACE WATER QUALITY CRITERIA FOR AQUATIC LIFE USE DESIGNATIONS.

01. General Criteria. The following criteria apply to all aquatic life use designations. Surface waters are not to vary from the following characteristics due to human activities: (3-15-02)

a. Hydrogen Ion Concentration (pH) values within the range of six point five (6.5) to nine point zero (9.0); (3-30-01)

b. The total concentration of dissolved gas not exceeding one hundred and ten percent (110%) of saturation at atmospheric pressure at the point of sample collection; (7-1-93)

02. Cold Water. Waters designated for cold water aquatic life are not to vary from the following characteristics due to human activities: (3-15-02)

a. Dissolved Oxygen Concentrations exceeding six (6) mg/l at all times. In lakes and reservoirs this standard does not apply to: (7-1-93)

i. The bottom twenty percent (20%) of water depth in natural lakes and reservoirs where depths are thirty-five (35) meters or less. (7-1-93)

ii. The bottom seven (7) meters of water depth in natural lakes and reservoirs where depths are greater than thirty-five (35) meters. (7-1-93)

iii. Those waters of the hypolimnion in stratified lakes and reservoirs. (7-1-93)

b. Water temperatures of twenty-two (22) degrees C or less with a maximum daily average of no greater than nineteen (19) degrees C. (8-24-94)

c. Temperature in lakes shall have no measurable change from natural background conditions. Reservoirs with mean detention times of greater than fifteen (15) days are considered lakes for this purpose. (3-15-02)

d. Ammonia. The following criteria are not to be exceeded dependent upon the temperature, T (degrees C), and pH of the water body: (3-15-02)

251. SURFACE WATER QUALITY CRITERIA FOR RECREATION USE DESIGNATIONS.

01. Primary Contact Recreation. Waters designated for primary contact recreation are not to contain E.coli bacteria significant to the public health in concentrations exceeding: (4-5-00)

a. For areas within waters designated for primary contact recreation that are additionally specified as public swimming beaches, a single sample of two hundred thirty-five (235) E. coli organisms per one hundred (100) ml. For the purpose of this subsection, "specified public swimming beaches" are considered to be indicated by features such as signs, swimming docks, diving boards, slides, or the like, boater exclusion zones, map legends, collection of a fee for beach use, or any other unambiguous invitation to public swimming. Privately owned swimming docks or the like which are not open to the general public are not included in this definition. (3-15-02)

b. For all other waters designated for primary contact recreation, a single sample of four hundred six (406) E.coli organisms per one hundred (100) ml; or (3-15-02)

c. A geometric mean of one hundred twenty-six (126) E.coli organisms per one hundred (100) ml based on a minimum of five (5) samples taken every three (3) to five (5) days over a thirty (30) day period. (4-5-00)

02. Secondary Contact Recreation. Waters designated for secondary contact recreation are not to contain E.coli bacteria significant to the public health in concentrations exceeding: (4-5-00)

a. A single sample of five hundred seventy-six (576) E.coli organisms per one hundred (100) ml; or (4-5-00)

b. A geometric mean of one hundred twenty-six (126) E.coli organisms per one hundred (100) ml based on a minimum of five (5) samples taken every three (3) to five (5) days over a thirty (30) day period. (4-5-00)

Appendix E. Data Sources

Table E-1. Data sources for Willow Creek Subbasin Assessment.

Waterbody	Data Source	Type of Data	When Collected
All	Western Regional Climate Center (www.wrcc.dri.edu)	Climate	Period of Record
All	Agrimet Station Data (www.mac1.usbr.gov/agrimet/location.html)	Air	Period of Record
All	Snotel (www.wrcc.dri.edu)	Snow Water Content	Period of Record
Willow Creek and Grays Lake	USGS (www.waterdata.usgs.gov/id/nwis/peak)	Streamflow	Period of Record
All	NRCS-Idaho Falls, Elliot Traher	Land Use	2003
All	NRCS-Idaho Falls, Elliot Traher	Conservation Programs	2003
Grays Lake	USGS-Idaho Falls, Jay Bateman	Streamflow Data	2002
Grays Lake Outlet, Hell Creek, Homer Creek, Sellars Creek, Tex Creek, and Willow Creek	IDFG-Idaho Falls, Jim Fredericks	Temperature	2001
Brockman Creek and Corral Creek	USFS-Idaho Falls, Lee Left	Temperature	2000-2002
Lava Creek, Long Valley Creek, Mill Creek, Sawmill Creek, and Sellars Creek	DEQ-Idaho Falls, Melissa Thompson	Temperature	2003
Willow Creek, Tex Creek, Grays Lake Outlet, and Hell Creek	BLM-Idaho Falls, Dan Kotanski	Water Quality	1992-2000
Willow Creek, Hell Creek, and Grays Lake Outlet	BLM-Idaho Falls, Dan Kotanski	Nutrient	1994-2000
Birch Creek, Homer Creek, Meadow Creek, Sellars Creek, Grays Lake Outlet, and Willow Creek	IASCD-Pocatello, Christine Fischer	Nutrient, Water Quality	2003
All	DEQ-Idaho Falls, Steve Robinson	BURP Monitoring	1993-2002
Lava Creek, Willow Creek, Sawmill Creek, and Willow Creek	MSE-Boise Idaho for DEQ-Idaho Falls	McNeil Sediment	2001

Grays Lake Outlet, Sellars Creek, and Willow Creek	DEQ-Idaho Falls, Steve Robinson	McNeil Sediment	2003
Brockman Creek, Buck Creek, Corral Creek, Crane Creek, Grays Lake Outlet, Hell Creek, Homer Creek, Lava Creek, Meadow Creek, Sawmill Creek, Seventy Creek, and Willow Creek	MSE-Boise Idaho for DEQ-Idaho Falls	Streambank Erosion Inventory	2001
Seventy Creek, Sellars Creek, Meadow Creek, Brockman Creek, Mill Creek, and Willow Creek	DEQ-Idaho Falls, Melissa Thompson	Streambank Erosion Inventory	2003
See Appendix M	DEQ-Idaho Falls, Steve Robinson	Fish	1996, 1997, 1999, and 2001
See Appendix M	BLM-Idaho Falls, Pat Koelsch	Fish	1985
See Appendix M	USFS-Idaho Falls, Jim Capurso	Fish	2002
See Appendix M	IDFG-Idaho Falls, Jim Fredericks	Fish	2001
See Appendix K	IDL-Idaho Falls, Heath Hancock	PFC	1997
See Appendix K	BLM (www.bitterrootrestoration.org)	PFC	1999, 2001, and 2002

Appendix F. IASCD Water Quality Data

Table F-1. Meadow Creek water quality data.

DATE	D.O.(mg/L)	TEMP(C)	%SAT	COND(microS)	TDS(mg/L)	pH	TIME	Q(cfs)	NO2+NO3:N(mg/L)	NH3(mg/L)	TSS(mg/L)	TVS(mg/L)	TPHOS(mg/L)	OPHOS(mg/L)
2-Jun-03	na	10.4	na	1349	652	7.78	910	0.554	<.05	<.05	48	4	0.11	0.06
16-Jun-03	9.24	12.2	86.1	1617	790	8.05	923	0.167	<.05	<.05	7	<2	0.06	<.05
30-Jun-03	too little water													
14-Jul-03	too little water													
30-Jul-03	dry													
12-Aug-03	dry													
26-Aug-03	dry													
11-Sep-03	dry													
7-Oct-03	dry													

Table F-2. Tex Creek water quality data.

DATE	D.O.(mg/L)	TEMP(C)	%SAT	COND(microS)	TDS(mg/L)	pH	TIME	Q(cfs)	NO2+NO3:N(mg/L)	NH3(mg/L)	TSS(mg/L)	TVS(mg/L)	TPHOS(mg/L)	OPHOS(mg/L)
2-Jun-03	9.12	12.6	85.7	1085	524	8.02	9.48	1.77	<.05	<.05	8	<2	0.08	<.05
16-Jun-03	9.6	13.8	92.9	1275	622	8.12	957	0.488	<.05	<.05	2	<2	0.06	<.05
30-Jun-03	9.46	14.4	92.6	1164	567	7.6	1001	0.145	<.05	0.09	18	5	0.07	<.05
14-Jul-03	too little water													
30-Jul-03	dry													
12-Aug-03	dry													
26-Aug-03	dry													
11-Sep-03	dry													
7-Oct-03	dry													

Table F-3. Willow Creek at Kepp's Crossing water quality data.

DATE	D.O.(mg/L)	TEMP(C)	%SAT	COND(microS)	TDS(mg/L)	pH	TIME	Q(cfs)	NO2+NO3:N(mg/L)	NH3(mg/L)	TSS(mg/L)	TVS(mg/L)	TPHOS(mg/L)	OPHOS(mg/L)
2-Jun-03	7.74	16.3	79	614	294	7.84	1034	41.37	<.05	0.05	4	<2	0.06	<.05
16-Jun-03	7.84	18.3	83.4	643	309	7.9	1031	18.73	<.05	<.05	<2	<2	0.05	<.05
30-Jun-03	7.58	19.2	82.2	478	228	7.29	1043	9.747	<.05	<.05	2	<2	0.06	<.05

14-Jul-03	7.27	20.4	80.6	471	225	8.02	1055	4.934	<.05	<.05	2	<2	0.06	<.05
30-Jul-03	5.54	19.2	59.7	610	292	8	907	2.624	<.05	<.05	2	<2	0.06	<.05
12-Aug-03	7.01	20.5	77.8	504	241	8.08	1005	1.84	<.05	<.05	2	<2	0.06	<.05
26-Aug-03	4.47	16.8	46.1	1865	917	7.71	923	3.918	<.05	<.05	3	<2	<.05	<.05
11-Sep-03	6.5	11.6	59.5	460	218	8.29	836	5.892	<.05	<.05	3	<2	<.05	<.05
7-Oct-03	5.23	11.7	48.6	486	232	8.32	1001	6.4	<.05	<.05	3	2	<.05	<.05

Table F-4. Birch Creek water quality data.

DATE	D.O.(mg/L)	TEMP(C)	%SAT	COND(microS)	TDS(mg/L)	pH	TIME	Q(cfs)	NO2+NO3:N(mg/L)	NH3(mg/L)	TSS(mg/L)	TVS(mg/L)	TPHOS(mg/L)	OPHOS(mg/L)
2-Jun-03	na	13.9	na	1256	608	8.1	1102	0.326	0.88	<.05	28	4	0.5	0.48
16-Jun-03	4.87	17.6	50	1336	652	8.17	1057	0.075	<.05	<.05	53	8	0.2	0.15
30-Jun-03	too little water													
14-Jul-03	too little water													
30-Jul-03	dry													
12-Aug-03	dry													
26-Aug-03	dry													
11-Sep-03	dry													
7-Oct-03	dry													

Table F-5. Sellars Creek water quality data.

DATE	D.O.(mg/L)	TEMP(C)	%SAT	COND(microS)	TDS(mg/L)	pH	TIME	Q(cfs)	NO2+NO3:N(mg/L)	NH3(mg/L)	TSS(mg/L)	TVS(mg/L)	TPHOS(mg/L)	OPHOS(mg/L)
2-Jun-03	8.72	13.1	82.9	655	315	7.6	1135	7.475	0.79	<.05	5	<2	0.1	<.05
16-Jun-03	6.58	16.3	67.2	767	369	7.56	1128	3.3	0.79	<.05	5	2	0.09	<.05
30-Jun-03	6.84	18.1	72.4	629	302	7.29	1128	2.351	0.97	<.05	5	<2	0.1	0.06
14-Jul-03	9.61	19.4	105	612	294	7.62	1139	0.274	0.78	0.05	6	<2	0.12	0.07
30-Jul-03	6.25	16.4	64	700	338	7.66	954	2.13	0.8	<.05	5	2	0.12	0.08
12-Aug-03	6.33	16.8	65.3	558	268	7.42	1048	0.158	0.81	<.05	18	4	0.15	0.08
26-Aug-03	6.69	14.6	65.7	1908	939	7.68	1010	0.303	0.88	<.05	2	<2	0.08	0.06
11-Sep-03	7.21	9.3	62.8	492	232	7.96	909	0.46	0.89	<.05	4	<2	<.05	<.05
7-Oct-03	5.94	9.9	52.8	528	253	7.93	1051	0.081	0.93	<.05	11	3	0.07	<.05

Table F-6. Willow Creek at Pole Bridge water quality data.

DATE	D.O.(mg/L)	TEMP(C)	%SAT	COND(microS)	TDS(mg/L)	pH	TIME	Q(cfs)	NO2+NO3:N(mg/L)	NH3(mg/L)	TSS(mg/L)	TVS(mg/L)	TPHOS(mg/L)	OPHOS(mg/L)
2-Jun-03	9.04	17.2	94.5	493	235	7.94	1204	11.23	0.79	0.06	3	<2	0.08	0.06
16-Jun-03	8.78	19.2	94.8	498	239	8.06	1146	8.502	<.05	<.05	<2	<2	0.06	<.05
30-Jun-03	7.4	20.7	81.8	406	194	7.81	1151	6.302	<.05	<.05	4	2	0.08	0.05
14-Jul-03	5.43	21.2	61.2	380	180	7.89	1203	5.498	0.77	<.05	4	<2	0.1	0.06
30-Jul-03	4.45	19.6	48.3	490	212	7.7	1024	4.428	0.78	<.05	7	2	0.09	0.08
12-Aug-03	4.8	19.8	52.7	380	180	7.76	1113	4.536	0.81	<.05	3	<2	<.05	<.05
26-Aug-03	8.28	17.4	86.4	1388	680	7.9	1100	4.04	0.82	<.05	<2	<2	<.05	<.05
11-Sep-03	7.42	10.7	67.1	365	172	8.12	932	3.268	0.86	<.05	13	3	<.05	<.05
7-Oct-03	6.46	11.4	58.9	372	139	8.08	1115	2.79	0.89	<.05	7	2	<.05	<.05

Table F-7. Homer Creek water quality data.

DATE	D.O.(mg/L)	TEMP(C)	%SAT	COND(microS)	TDS(mg/L)	pH	TIME	Q(cfs)	NO2+NO3:N(mg/L)	NH3(mg/L)	TSS(mg/L)	TVS(mg/L)	TPHOS(mg/L)	OPHOS(mg/L)
2-Jun-03	8.93	18.8	95.9	743	358	8.13	1235	0.816	<.05	0.06	2	<2	<.05	<.05
16-Jun-03	9.34	18.9	101	829	400	8.12	1218	0.335	<.05	<.05	11	4	<.05	<.05
30-Jun-03	9.84	19.9	108	670	321	7.89	1219	0.267	<.05	<.05	10	3	0.1	<.05
14-Jul-03	dry													
30-Jul-03	dry													
12-Aug-03	dry													
26-Aug-03	dry													
11-Sep-03	dry													
7-Oct-03	dry													

Table F-8. Grays Lake Outlet water quality data.

DATE	D.O.(mg/L)	TEMP(C)	%SAT	COND(microS)	TDS(mg/L)	pH	TIME	Q(cfs)	NO2+NO3:N(mg/L)	NH3(mg/L)	TSS(mg/L)	TVS(mg/L)	TPHOS(mg/L)	OPHOS(mg/L)
2-Jun-03	10.92	18.1	116	554	265	8.3	1257	8.745	<.05	0.05	4	<2	<.05	<.05
16-Jun-03	10.17	20.1	112	530	255	8.17	1227	1.808	<.05	0.19	26	6	0.07	<.05

30-Jun-03	9.99	20.3	111	479	229	8.02	1237	1.206	<.05	<.05	7	2	0.05	<.05
14-Jul-03	8.45	21.4	95.7	421	201	8.22	1255	1.192	<.05	0.06	11	2	0.08	<.05
30-Jul-03	7.87	19.9	86.3	483	232	8.47	1101	1.34	<.05	<.05	5	<2	0.06	<.05
12-Aug-03	8.77	20.8	97.9	425	203	7.52	1144	0.79	<.05	<.05	6	<2	0.06	<.05
26-Aug-03	8.49	17.6	89.2	1587	776	8.5	1133	0.658	<.05	<.05	5	<2	<.05	<.05
11-Sep-03	7.9	9.9	69.9	426	201	8.48	1000	0.734	<.05	<.05	13	4	<.05	<.05
7-Oct-03	6.48	10.9	58.7	411	200	8.26	1150	0.722	<.05	<.05	3	<2	<.05	<.05

Appendix G. DEQ BURP Water Quality Data

Table G-1. DEQ BURP Water Quality Data

Stream Name	WBID	Year	Elev. (ft)	Rosgen Channel Type	% Fines	% Stable		% Covered	
						Left Bank	Right Bank	Left Bank	Right Bank
Non-303(d) Listed Streams									
Bridge Creek	US-21	1998	6520	G	82	90	92	87	92
Bulls Fork Creek	US-30	1997	6320	E	99	72	65	92	100
	US-30	1997	5950	F	93	83	95	84	89
Canyon Creek	US-8	1997	6050	C	83	77	91	57	73
Cattle Creek	US-16	1997	6140	F	100	100	100	100	0
Clark Creek	US-21	1997	6440	D	75	90	94	96	98
Dan Creek	US-29	1998	6700	E	84	89	83	89	83
	US-29	1996	6000	G	87	87	70	87	70
Deep Creek	US-32	1997	5245	B	83	94	86	94	80
Eagle Creek North Fork	US-21	1998	6740	C	38	100	22	82	89
Gravel Creek	US-23	1998	6615	C	56	100	98	100	99
	US-23	1998	6596	B	43	100	100	100	99
Indian Fork Tex Creek	US-31	1997	5820	E	100	95	94	80	83
Mud Creek	US-9	1997	6540	C	100	11	30	3	68
Mud Spring Creek	US-32	1998	5560	B	82	96	100	94	100
	US-32	1997	5250	A	69	83	83	83	83
Pipe Creek	US-31	1998	5940	F	84	96	81	82	85
	US-31	1997	5805	F	99	72	96	92	96
Shirley Creek	US-24	1998	6260	E	51	96	61	96	61
Squaw Creek	US-7	1996	6220	C	71	79	87	79	85
	US-7	1996	6200	B	78	86	75	93	85
	US-7	2001	5720	G	60	11	8	49	88
Willow Creek2	US-21	1997	6755	B	52	88	100	98	100
	US-21	1998	6760	C	47	100	100	96	96
303(d) Listed Streams									
Birch Creek	US-6	1996	6120	B	84	78	81	88	71
	US-6	2001	5920	F	34	90	86	98	100
	US-6	1996	5900	B	71	91	85	95	85
	US-6	1996	5640	B	97	0	3	67	75
Brockman Creek	US-25	1998	6590	E	80	96	94	98	100
	US-25	1994	6420	C	27	30	45	5	0
	US-24	1994	6180	C	24when	10	5	70	55
Buck Creek	US-12	1996	6360	C	70	3	4	87	96
	US-12	2001	6360	E	74	57	60	85	80
Corral Creek	US-26	1994	6680	C	38	65	50	90	75
	US-26	2001	6360	E	38	76	82	78	100
	US-26	1994	6360	F	27	45	40	60	75
Crane Creek	US-14	1998	6440	E	89	84	100	81	100
	US-14	1997	6480	E	100	100	100	100	100
	US-14	1997	6335	E	34	60	100	100	100
Grays Lake Outlet	97-M140	1997	6375	C	71	100	100	100	100
	97-M141	1997	5960	B	26	99	100	99	100
	95-B073	1995	5600	B	25	100	80	0	0
	95-B069	1995	5560	B	28	100	40	100	49
Hell Creek	US-29	1994	6600		69	51	10	85	90
	US-29	1995	5880	B	42	60	75	70	85
	US-29	1995	5600	B	42	60	45	70	55
Homer Creek	US-18	1995	6000	B	22	85	75	80	80
Lava Creek	US-28	1994	6680	F	32	10	20	30	45
	US-28	2001	6320	C	20	82	77	74	100
	US-28	1994	6140	C	12	35	50	45	55

Long Valley Creek	US-15	1997	6225	F	100	100	100	100	100
	US-15	1997	6125	D	97	100	100	92	86
Meadow Creek	US-32	1998	6180	G	67	99	89	100	93
	US-32	1995	6100	B	67	40	55	95	80
	US-32	1996	5850	B	90	0	0	64	32
	US-32	1996	5640	B	57	0	0	62	88
	US-32	1995	5240	C	92	20	20	100	100
Mill Creek	US-12	2001	6360	E	50	69	95	99	100
	US-12	1995	6540	C	62	38	44	100	100
	US-12	1995	6320		39	100	90	100	100
Rock Creek	US-5	1997	5950	B	100	100	100	63	59
Sawmill Creek	US-27	1994	6480	B	66	30	20	85	70
	US-27	1994	6360	B	10	35	50	45	60
Sellars Creek	US-10	1996	6600	A	96	28	42	77	83
	US-10	2001	6360	C	35	60	65	75	76
	US-10	1995	6120	C	32	20	50	100	90
Seventy Creek	US-11	1995	6640	C	89	90	80	100	95
	US-11	1995	6350	B	49	100	100	100	100
Tex Creek	US-31	1995	6000	B	52	19	23	86	85
	US-31	1995	5940	B	42	65	70	80	80
	US-31	1995	5540	B	32	80	81	98	63
	US-31	1995	5540	C	54	85	95	85	95
Willow Creek	US-13	1997	6525	E	97	80	100	100	100
	US-11	2001	6200	B	6	100	100	100	100
	US-11	1997	6200	B	52	96	100	100	100
	US-8	1995	5900	B	20	100	58	55	81
	US-5	1995	5480	B	34	68	100	55	83
	US-5	1995	5300	C	28	65	68	80	83
Mean for Non-Listed Streams					76	83	80	84	83
Mean for 303(d) Listed Streams					52	64	65	80	80
Average for all Streams					64	72	71	82	82

Appendix H. Subsurface Fine Sampling Results

Table H-1. Sawmill Creek McNeil data

McNeil Sediment Core Sampling Form					
Stream	Sawmill Creek				
Sample Number Sieve Size (inches)	**1** ML	**2** ML	**3** ML		
2.5	0	650	1291		
1	576	1240	1236		
0.5	774	1080	741		
0.25	831	658	847		
1.0 - 0.25" Subtotal	2181	2978	2824		
#4	410	235	260		
#8	436	275	735		
#20	461	225	482		
#70	639	420	979		
#270	642	450	696		
<0.25" Subtotal	2588	1605	3152		
Sample Total					
W/O 2.5"	4769	4583	5976	Mean	Std. Dev.
% Fines W/O .25"	**54.27%**	**35.02%**	**52.74%**	**47.34%**	**0.106994**
Sample Total					
W 2.5"	4769	5233	7267	Mean	Std. Dev.
% Fines W .25"	**54.27%**	**30.67%**	**43.37%**	**42.77%**	**0.118097**

Table H-2. Willow Creek McNeil data

McNeil Sediment Core Sampling Form					
Stream	Kepp's Crossing				
Sample Number Sieve Size (inches)	**1** ML	**2** ML	**3** ML		
2.5	980	178	250		
1	2621	2044	2290		
0.5	941	833	1083		
0.25	618	640	808		
1.0 - 0.25" Subtotal	4180	3517	4181		
#4	160	143	130		
#8	368	357	496		
#20	439	580	960		
#70	285	697	532		
#270	85	120	115		
<0.25" Subtotal	1337	1897	2233		
Sample Total					
W/O .25"	5517	5414	6414	Mean	Std. Dev.
% Fines W/O .25"	**24.23%**	**35.04%**	**34.81%**	**31.36%**	**0.061743**
Sample Total					
W 2.5"	6497	5592	6664	Mean	Std. Dev.

% Fines W .25"	**20.58%**	**33.92%**	**33.51%**	**29.34%**	**0.075876**

Table H-3. Willow Creek McNeil data

McNeil Sediment Core Sampling Form					
Stream	Willow Creek at Gray Lake Outlet				
Sample Number Sieve Size (inches)	**1** ML	**2** ML	**3** ML		
2.5	932	2275	2220		
1	1725	815	865		
0.5	685	400	425		
0.25	510	464	334		
1.0 - 0.25" Subtotal	2920	1679	1624		
#4	145	60	60		
#8	324	224	310		
#20	244	56	226		
#70	258	278	340		
#270	104	56	90		
<0.25" Subtotal	1075	674	1026		
Sample Total					
W/O 2.5"	3995	2353	2650	Mean	Std. Dev.
% Fines W/O 2.5"	**26.91%**	**28.64%**	**38.72%**	**31.42%**	**0.063758**
Sample Total					
W .25"	4927	4628	4870	Mean	Std. Dev.
% Fines W .25"	**21.82%**	**14.56%**	**21.07%**	**19.15%**	**0.039896**

Table H-4. Lava Creek McNeil data

McNeil Sediment Core Sampling Form			
Stream	Lava Creek		
Sample Number Sieve Size (inches)	**1** ML	**2** ML	**3** ML
2.5	975	1240	585
1	1275	900	1315
0.5	595	485	670
0.25	265	260	390
1.0 - 0.25" Subtotal	2135	1645	2375
#4	104	50	117
#8	140	126	236
#20	140	88	224
#70	186	104	222
#270	130	58	127
<0.25" Subtotal	700	426	926
Sample Total			

W/O 2.5"	2835	2071	3301	Mean	Std. Dev.
% Fines W/O .25"	**24.69%**	**20.57%**	**28.05%**	**24.44%**	**0.037476**
Sample Total					
W 2.5"	3810	3311	3886	Mean	Std. Dev.
% Fines W .25"	**18.37%**	**12.87%**	**23.83%**	**18.36%**	**0.054814**

Table H-5. Mill Creek McNeil data

McNeil Sediment Core Sampling Form

Stream: Mill Creek Above Willow Creek

Sample Number Sieve Size (inches)	**1** ML	**2** ML	**3** ML		
2.5	166	0	0		
1	1675	465	690		
0.5	1125	1050	940		
0.25	825	915	660		
1.0 - 0.25" Subtotal	3625	2430	2290		
#4	274	250	250		
#8	430	755	490		
#20	318	670	595		
#70	296	965	450		
#270	125	425	95		
<0.25" Subtotal	1443	3065	1880		
Sample Total					
W/O 2.5"	5068	5495	4170	Mean	Std. Dev.
% Fines W/O .25"	**28.47%**	**55.78%**	**45.08%**	**0.431115**	**0.137590**
Sample Total					
W 2.5"	5234	5495	4170	Mean	Std. Dev.
% Fines W .25"	**27.57%**	**55.78%**	**45.08%**	**0.428105**	**0.142408**

Table H-6. Grays Lake Outlet McNeil data

McNeil Sediment Core Sampling Form

Stream	Grays Lake Outlet		
Date	9/18/2003		
Location:	300 m upstream from Homer Creek confluence		
Lat/Lon: N:	43	16	7.01
W:	111	38	26.95
Site Desc:	1997SIDFM141		
Personnel:	Jack Rainey and Suzie		
Vegetation:	willows, grasses		
Flow (cfs):	1.5		
Rosgen Channel:			
Reach Gradient:	1.00%		
Geology: (Q G V S)			

Target Species	Salmonid Spawning				
Sample Number	**1**	**2**	**3**		
Ocular Est. Surf Fns					
Sieve Size (inches)	ML	ML	ML		
2.5	310	0	100		
1	1280	1360	40		
0.5	600	540	280		
0.25	120	220	250		
1.0 - 0.25" Subtotal	2000	2120	570		
#4	30	70	90		
#8	60	160	240		
#20	120	120	140		
#70	200	440	1580		
#270	100	140	440		
<0.25" Subtotal	510	930	2490		
Sample Total					
W/O 2.5"	2510	3050	3060	Mean	Std. Dev.
% Fines W/O .25"	**0.203187**	**0.304918**	**0.813725**	**0.44061**	**0.327106**
Sample Total					
W 2.5"	2820	3050	3160	Mean	Std. Dev.
% Fines W .25"	0.180851	0.304918	0.787975	0.424581	0.320764

Table H-7. Sellars Creek McNeil data

McNeil Sediment Core Sampling Form			
Stream	Sellars Creek		
Date	9/15/2003		
Location:	0.4 miles above Blackfoot Reservoir Rd.		
Lat/Lon: N:	43	15	39.55
W:	111	50	0.96
Site Desc:	2001STDFA034		
Personnel:	Jack Rainey and Suzie		
Vegetation:	sparse willows, grass, sedges		
Flow:	0.7cfs		
Rosgen Channel:	C		
Reach Gradient:	1.00%		
Geology: (Q G V S)			
Target Species	Salmonid Spawning		
Sample Number	**1**	**2**	**3**
Ocular Est. Surf Fns			
Sieve Size (inches)	ML	ML	ML
2.5	0	210	0
1	225	460	110
0.5	1200	2420	1550
0.25	2360	3460	2010
1.0 - 0.25" Subtotal	3785	6340	3670
#4	820	580	500
#8	2160	1440	510
#20	1500	1430	1140

#70	2240	2520	1085		
#270	230	160	280		
<0.25" Subtotal	6950	6130	3515		
Sample Total W/O 2.5"	10735	12470	7185	Mean	Std. Dev.
% Fines W/O .25"	**0.647415**	**0.49158**	**0.489214**	**0.542736**	**0.090662**
Sample Total W 2.5"	10735	12680	7185	Mean	Std. Dev.
% Fines W .25"	0.647415	0.483438	0.489214	0.540022	0.09305

Table H-8. Willow Creek McNeil data

McNeil Sediment Core Sampling Form					
Stream	Willow Creek				
Date	9/17/2003				
Location:	Kepp's Crossing on BLM ground				
Lat/Lon: N:	43	24	27.91		
W:	111	47	6.88		
Site Desc:					
Personnel:	Jack Rainey and Suzie				
Vegetation:	Juniper trees, sage brush				
Flow (cfs):	6.3				
Rosgen Channel:	C				
Reach Gradient:	2.00%				
Geology: (Q G V S)					
Target Species	Salmonid Spawning				
Sample Number	**1**	**2**	**3**		
Ocular Est. Surf Fns					
Sieve Size (inches)	ML	ML	ML		
2.5	1380	110	1100		
1	2400	610	1740		
0.5	700	220	500		
0.25	380	160	220		
1.0 - 0.25" Subtotal	3480	990	2460		
#4	160	90	70		
#8	160	180	80		
#20	410	50	90		
#70	340	70	130		
#270	90	50	70		
<0.25" Subtotal	1160	440	440		
Sample Total W/O 2.5"	4640	1430	2900	Mean	Std. Dev.
% Fines W/O .25"	**0.25**	**0.307692**	**0.151724**	**0.236472**	**0.078859**
Sample Total W 2.5"	6020	1540	4000	Mean	Std. Dev.
% Fines W .25"	0.192691	0.285714	0.11	0.196135	0.087908

Appendix I. Streambank Erosion Inventory Method

Streambank Erosion Inventory

The streambank erosion inventory used to estimate background and existing streambank erosion followed methods outlined in the proceedings from the Natural Resource Conservation Service (NRCS) Channel Evaluation Workshop (NRCS, 1983). Using the direct volume method, sub-sections of 1996 §303(d) watersheds were surveyed to determine the extent of chronic bank erosion and estimate the needed reductions.

The NRCS Stream Bank Erosion Inventory is a field based methodology, which measures streambank/channel stability, length of active eroding banks, and bank geometry (Stevenson, 1994). The streambank/channel stability inventories were used to estimate the long-term lateral recession rate. The recession rate is determined from field evaluation of streambank characteristics that are assigned a categorical rating ranging from 0 to 3. The categories of rating the factors and rating scores are:

Bank Stability:
- Do not appear to be eroding - 0
- Erosion evident - 1
- Erosion and cracking present - 2
- Slumps and clumps sloughing off - 3

Bank Condition:
- Some bare bank, few rills, no vegetative overhang - 0
- Predominantly bare, some rills, moderate vegetative overhang - 1
- Bare, rills, severe vegetative overhang, exposed roots - 2
- Bare, rills and gullies, severe vegetative overhang, falling trees - 3

Vegetation / Cover On Banks:
- Predominantly perennials or rock-covered - 0
- Annuals / perennials mixed or about 40% bare - 1
- Annuals or about 70% bare - 2
- Predominantly bare – 3

Bank / Channel Shape:
- V - Shaped channel, sloped banks - 0
- Steep V - Shaped channel, near vertical banks - 1
- Vertical Banks, U - Shaped channel - 2
- U - Shaped channel, undercut banks, meandering channel - 3

Channel Bottom:
- Channel in bedrock / noneroding - 0
- Soil bottom, gravels or cobbles, minor erosion - 1
- Silt bottom, evidence of active downcutting - 2

Deposition:
- No evidence of recent deposition - 1
- Evidence of recent deposits, silt bars - 0

Cumulative Rating

Slight (0-4)   Moderate (5-8)   Severe (9+)

From the Cumulative Rating, the lateral recession rate is assigned.

0.01 - 0.05 feet per year	**Slight**
0.06 - 0.15 feet per year	**Moderate**
0.16 - 0.3 feet per year	**Severe**
0.5+ feet per year	**Very Severe**

Streambank stability can also be characterized through the following definition and the corresponding streambank erosion condition rating from Bank Stability or Bank Condition above are included in italics.
Streambanks are considered stable if they do not show indications of any of the following features:

- **Breakdown** - Obvious blocks of bank broken away and lying adjacent to the bank breakage. *Bank Stability Rating 3*
- **Slumping or False Bank** - Bank has obviously slipped down, cracks may or may not be obvious, but the slump feature is obvious. *Bank Stability Rating 2*
- **Fracture** - A crack is visibly obvious on the bank indicating that the block of bank I about to slump or move into the stream. *Bank Stability Rating 2*
- **Vertical and Eroding** - The bank is mostly uncovered and the bank angle is steeper than 80 degrees from the horizontal. *Bank Stability Rating 1*

Streambanks are considered covered if they show any of the following features:

- Perennial vegetation ground cover is greater than 50%. *Vegetation/Cover Rating 0*
- Roots of vegetation cover more than 50% of the bank (deep rooted plants such as willows and sedges provide such root cover). *Vegetation/Cover Rating 1*
- At least 50% of the bank surfaces are protected by rocks of cobble size or larger. *Vegetation/Cover Rating 0*
- At least 50% of the bank surfaces are protected by logs of 4 inch diameter or larger. *Vegetation/Cover Rating 1*

Streambank stability is estimated using a simplified modification of Platts, Megahan, and Minshall (1983, p. 13) as stated in *Monitoring Protocols to Evaluate Water Quality Effects of Grazing Management on Western Rangeland Streams* (Bauer and Burton, 1993). The modification allows for measuring streambank stability in a more objective fashion. The lengths of banks on both sides of the stream throughout the entire linear distance of the representative reach are measured and proportioned into four stability classes as follows:

- **Mostly covered and stable (non-erosional).** Streambanks are Over 50% Covered as defined above. Streambanks are Stable as defined above. Banks associated with gravel bars having perennial vegetation above the scourline are in this category. *Cumulative Rating 0 - 4 (slight erosion) with a corresponding lateral recession rate of 0.01 - 0.05 feet per year.*
- **Mostly covered and unstable (vulnerable).** Streambanks are Over 50% Covered as defined above. Streambanks are Unstable as defined above. Such banks are typical of ?false banks” observed in meadows where breakdown, slumping, and/or fracture show

instability yet vegetative cover is abundant. *Cumulative Rating 5 - 8 (moderate erosion) with a corresponding lateral recession rate of 0.06 - 0.2 feet per year.*
- **Mostly uncovered and stable (vulnerable).** Streambanks are less than 50% Covered as defined above. Streambanks are Stable as defined above. Uncovered, stable banks are typical of streambanks trampled by concentrations of cattle. Such trampling flattens the bank so that slumping and breakdown do not occur even though vegetative cover is significantly reduced or eliminated. *Cumulative Rating 5 - 8 (moderate erosion) with a corresponding lateral recession rate of 0.06 - 0.2 feet per year.*
- **Mostly uncovered and unstable (erosional).** Streambanks are less than 50% Covered as defined above. They are also Unstable as defined above. These are bare eroding streambanks and include ALL banks mostly uncovered, which are at a steep angle to the water surface. *Cumulative Rating 9+ (severe erosion) with a corresponding lateral recession rate of over 0.5 feet per year.*

Streambanks were inventoried to quantify bank erosion rate and annual average erosion. These data were used to develop a quantitative sediment budget to be used for TMDL development.

Site Selection

The first step in the bank erosion inventory is to identify key problem areas. Streambank erosion tends to increase as a function of watershed area (NRCS, 1983). As a result, the lower stream segment of larger watersheds tend to be problem areas. These stream segments tend to be alluvial streams commonly classified as response reaches (Rosgen B and C channel types) (Rosgen,1996).
Because it is often unrealistic to survey every stream segment, sampled reaches were used and bank erosion rates are extrapolated over a larger stream segment. The length of the sampled reach is a function of stream type variability where streams segments with highly variable channel types need a large sample, whereas segments with uniform gradient and consistent geometry need less. Typically between 10 and 30 percent of streambank needs to be inventoried. Often, the location of some stream inventory reaches is more dependent on land ownership than watershed characteristics. For example, private land owners are sometimes unwilling to allow access to stream segments within their property.
Stream reaches are subdivided into *sites* with similar channel and bank characteristics. Breaks between sites are made where channel type and/or dominate bank characteristics change substantially. In a stream with uniform channel geometry there may be only one site per stream reach, whereas in an area with variable conditions there may be several sites. Subdivision of stream reaches is at the discretion of the field crew leader.

Field Methods

Streambank erosion or channel stability inventory field methods were originally developed by the USDA USFS (Pfankuch, 1975). Further development of channel stability inventory methods are outlined in Lohrey (1989) and NRCS (1983). As stated above, the NRCS (1983) document outlines field methods used in this inventory. However, slight modifications to the field methods were made and are documented.

Field crews typically consist of two to four people and are trained as a group to ensure quality control or consistent data collection. Field crews survey selected stream reaches measuring bank length, slope height, bankfull width and depth, and bank content. In most cases, a Global Positioning System (GPS) is used to locate the upper and lower boundaries of inventoried stream reaches. Additionally, while surveying field crews photograph key problem areas.

Bank Erosion Calculations

The direct volume method is used to calculate average annual erosion rates for a given stream segment based on bank recession rate determined in the survey (NRCS, 1983). The erosion rate (tons/mile/year) is used to estimate the total bank erosion of the selected stream corridor.

The direct volume method is summarized in the following equations:

$$E = [A_E * R_{LR} * ?_B]/2000 \text{ (lbs/ton)}$$

where:
E = bank erosion over sampled stream reach (tons/yr/sample reach)
A_E = eroding area (ft^2)
R_{LR} = lateral recession rate (ft/yr)
$?_B$ = bulk density of bank material (lps/ft^3)

The bank erosion rate (E_R) is calculated by dividing the sampled bank erosion (E) by the total stream length sampled:

$$E_R = E/L_{BB}$$

where:
E_R = bank erosion rate (tons/mile/year)
E = bank erosion over sampled stream reach (tons/yr/sample reach)
L_{BB} = bank to bank stream length over sampled reach

Total bank erosion is expressed as an annual average. However, the frequency and magnitude of bank erosion events are greatly a function of soil moisture and stream discharge (Leopold et al, 1964). Because channel erosion events typically result from above average flow events, the annual average bank erosion value should be considered a long term average. For example, a 50 year flood event might cause five feet of bank erosion in one year and over a ten year period this events accounts for the majority of bank erosion. These factors have less of an influence where bank trampling is the major cause of channel instability.

The *eroding area* (A_E) is the product of linear horizontal bank distance and average bank slope height. Bank length and slope heights are measured while walking along the stream channel. Pacing is used to measure horizontal distance, and bank slope heights are continually measured and averaged over a given reach or site. The horizontal length is the length of the right or left bank, not both. Typically, one bank along the stream channel is actively eroding. For example, the bank on the outside of a meander. However, both banks of channels with severe headcuts or gullies will be eroding and are to be measured separately and eventually summed.

Determining the *lateral recession rate* (R_{LR}) is one of the most critical factors in this methodology (NRCS, 1983). Several techniques are available to quantify bank erosion rates: for example, aerial photo interpretation, anecdotal data, bank pins, and channel cross-sections.

To facilitate consistent data collection, the NRCS developed rating factors used to estimate lateral recession rate. Similar to methods developed by Pfankuch (1975), the NRCS method measures bank and channel stability, and then uses the ratings as surrogates for bank erosion rates.

The *bulk density* (ρ_B) of bank material is measured ocularly in the field. Soil bulk density is the weight of material divided by its volume, including the volume of its pore spaces. A table of typical soil bulk densities can be used, or soil samples can be collected and soil bulk density measured in the laboratory.

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Appendix J. Proper Functioning Condition Data

Table J-1. BLM summary of Willow Creek watershed stream riparian conditions.

Stream	WBID	Date of Data Collection	Health	Miles	Location				
					Township	Range	Section	1/4 Section	1/4 1/4 Section
Bear Creek	4	10/13/99	NF	0.5	2N	40E	35	SE	SE
Bear Creek	4	10/13/99	NF	0.65	2N	40E	35	SE	NW
Bear Creek	4	10/13/99	NF	0.55	2N	40E	35	SW	SW
Cattle Creek	16	10/10/99	FAR	0.6	1S	40E	11	NE	NE
Cove Creek	31	7/21/97	FAR	0.61	1N	41E	21	NE	SE
Cove Creek	31	7/22/97	FAR	0.74	1N	41E	23	NW	NW
Grays Lake Outlet*	16	8/6/96	FAR	0.79	1N	40E	33	SW	NE
Grays Lake Outlet*	13	7/7/98	FAR	0.79	1N	40E	33	SW	NE
Grays Lake Outlet*	16	8/1/96	PFC	0.25	1S	40E	13	NW	SE
Grays Lake Outlet*	16	8/1/96	PFC	0.37	1S	40E	13	NW	NE
Grays Lake Outlet*	17	8/1/96	PFC	0.75	1S	40E	24	SE	NW
Grays Lake Outlet*	17	8/2/96	PFC	1.03	1S	41E	30	NE	SE
Grays Lake Outlet*	17	8/2/96	PFC	0.18	1S	41E	19	SW	SW
Grays Lake Outlet*	17	8/2/96	PFC	0.63	1S	40E	24	SE	NW
Grays Lake Outlet*	16	8/5/96	NF	0.88	1S	40E	11	SE	NW
Grays Lake Outlet*	16	8/5/96	NF	0.73	1S	40E	11	NE	SW
Grays Lake Outlet*	16	8/5/96	FAR	0.97	1S	40E	2	SW	NW
Grays Lake Outlet*	16	8/6/96	FAR	0.66	1S	40E	3	NE	NW
Grays Lake Outlet*	16	10/8/99	PFC	0.38	1S	41E	17	SE	NE
Grays Lake Outlet*	17	7/19/00	PFC	1.03	1S	41E	30	NE	SE
Grays Lake Outlet*	17	7/27/00	PFC	0.63	1S	40E	24	SE	NW
Grays Lake Outlet*	16	6/20/01	NF	0.88	1S	40E	11	SE	NW
Hell Creek*	29	8/1/96	NF	0.33	1S	41E	18	SW	NW
Hell Creek*	29	8/1/96	NF	0.64	1S	40E	13	NE	SW
Hell Creek*	29	8/1/96	NF	0.1	1S	40E	13	NW	SE
Hell Creek*	29	10/9/99	NF	0.5	1S	42E	18	SE	SE
Hell Creek*	29	10/9/99	FAR	0.5	1S	42E	18	NE	SW
Hell Creek*	29	6/13/02	FAR	0.64	1S	40E	13	NE	SW
Hell Creek*	29	6/13/02	FAR	0.33	1S	41E	18	SW	NW
Meadow Creek*	32	7/22/97	FAR	0.32	2N	41E	35	NW	SE
Pipe Creek	31	7/23/97	FAR	0.42	1N	41E	7	SW	NW
Tex Creek*	31	7/21/97	FAR	0.52	1N	41E	26	SW	NE
Tex Creek*	31	7/21/97	FAR	0.33	1N	41E	27	NW	SE
Tex Creek	31	7/23/97	FAR	0.86	1N	41E	7	SW	SE
Twin Creek	8	5/31/01	PFC	0.5	1S	40E	28	SW	NE
Unnamed Tributary to Tex Creek	31	7/23/97	FAR	0.18	1N	40E	12	NE	NE
Willow Creek*	5	7/31/96	PFC	0.7	1N	40E	20	NW	NW
Willow Creek*	5	7/31/96	PFC	0.37	1N	40E	19	NE	NE

Willow Creek*	5	8/6/96	FAR	0.64	1N	40E	28	SW	NE
Willow Creek*	5	8/6/96	NF	0.61	1N	40E	32	SE	SE
Willow Creek*	5	8/6/96	NF	0.77	1N	40E	32	NE	SE
Willow Creek*	5	8/6/96	FAR	0.55	1N	40E	33	NW	SW
Willow Creek*	5	8/6/96	FAR	0.6	1N	40E	33	NW	NE
Willow Creek*	5	8/7/96	FAR	0.25	1N	40E	28	NW	NW
Willow Creek*	5	8/7/96	PFC	0.64	1N	40E	29	NE	NE
Willow Creek*	5	8/7/96	NF	0.67	1N	40E	29	NW	NW
Willow Creek*	5	7/24/97	FAR	0.65	1N	40E	5	NW	SW
Willow Creek*	5	7/24/97	FAR	0.79	1N	40E	5	SW	NE
Willow Creek*	5	7/24/97	FAR	0.58	1N	40E	8	NE	NE
Willow Creek*	5	7/7/98	FAR	0.64	1N	40E	28	SW	NE
Willow Creek*	5	7/7/98	FAR	0.55	1N	40E	33	NW	SW
Willow Creek*	5	9/20/98	PFC	0.55	1N	40E	20	NW	NE
Willow Creek*	5	9/20/98	PFC	0.5	1N	40E	17	SW	SE
Willow Creek*	5	9/21/98	PFC	0.8	1N	40E	17	NW	NE
Willow Creek*	5	9/21/98	FAR	0.65	1N	40E	7	SE	SE
Willow Creek*	5	8/11/99	PFC	0.5	1N	40E	10	NE	NE
Willow Creek*	4	10/10/99	PFC	0.8	1N	40E	3	SE	NE
Willow Creek*	4	10/11/99	PFC	0.68	1N	40E		NW	NW
Willow Creek*	5	6/20/01	FAR	0.25	1N	40E	28	NW	NW

Note: * = 303(d) listed reach
Source: (www.bitterrootrestoration.com)

Table J-2. IDL 1999 PFC data.

1999			
Stream	**WBID**	**Miles**	**Health**
Brockman Creek	24	0.33	PFC
Brockman Creek	24	2.09	FAR
Brockman Creek	24	0.16	PFC
Brockman Creek	24	0.63	PFC
Brockman Creek	24	0.71	PFC
Chicken Creek	18	0.61	FAR
Chicken Creek	18	1.43	FAR
Chicken Creek	18	0.89	PFC
Dan Creek	29	0.26	FAR
Dan Creek	29	0.41	NF
Dan Creek	29	0.25	PFC
Grays Lake Outlet	17	0.66	FAR
Grays Lake Outlet	19	0.17	FAR
Grays Lake Outlet	19	0.48	FAR
Grays Lake Outlet	19	0.81	FAR
Grays Lake Outlet	19	0.66	PFC
Grays Lake Outlet	20	0.19	FAR

Grays Lake Outlet	17	0.43	NF
Grays Lake Outlet	19	0.28	FAR
Grays Lake Outlet	19	0.29	FAR
Grays Lake Outlet	19	0.56	FAR
Grays Lake Outlet	19	1.11	FAR
Grays Lake Outlet	19	1.07	PFC
Grays Lake Outlet	20	1.19	FAR
Grays Lake Outlet	20	1.57	PFC
Hell Creek	29	0.96	FAR
Homer Creek	18	0.46	FAR
Homer Creek	18	1.74	PFC
Homer Creek	18	0.19	FAR
Homer Creek	18	0.67	FAR
Homer Creek	18	2.32	FAR
Homer Creek	18	0.54	FAR
Homer Creek	18	0.21	NF
Homer Creek	18	0.48	NF
Homer Creek	18	0.00	PFC
Homer Creek	18	0.28	PFC
Homer Creek	18	1.10	PFC
Homer Creek	18	0.22	PFC
Homer Creek	18	1.74	PFC
Homer Creek	18	0.50	PFC
Homer Creek	18	0.86	PFC
Jim Creek	19	0.35	FAR
Jim Creek	19	0.40	FAR
Jim Creek	19	0.68	NF
Jim Creek	19	0.41	FAR
Jim Creek	19	0.84	FAR
Jim Creek	19	0.90	NF
Jim Creek	19	0.62	NF
Lava Creek	28	0.72	FAR
Lava Creek	28	0.27	PFC
Lava Creek	28	0.12	FAR
Lava Creek	28	0.41	FAR
Lava Creek	28	0.18	PFC
Lava Creek	28	0.59	PFC
Lava Creek	28	0.74	PFC
Lava Creek	28	0.42	FAR
Lava Creek	28	1.27	PFC
Long Valley Creek	15	3.31	FAR
Long Valley Creek	15	0.32	PFC
M Fk Sawmill Ck	27	0.62	PFC
M Fk Sawmill Ck	27	0.56	FAR

N Fk Sawmill Ck	27	0.93	FAR
N Fork Lava Creek	28	1.32	PFC
S Fk Sawmill	27	0.62	PFC
S Fk Sawmill	27	0.83	PFC
S Fork Jim Creek	19	1.01	FAR
S Fork Lava Creek	28	0.32	PFC
S Fork Lava Creek	28	0.58	PFC
Sawmill	27	0.61	PFC
Sawmill Creek	27	0.44	FAR
Shirley Creek	24	0.29	PFC
Shirley Creek	24	0.40	PFC
Shirley Creek	24	0.68	NF
Shirley Creek	24	0.06	PFC
Shirley Creek	24	0.29	PFC

Table J-3. IDL 2001 PFC data.

2001			
Stream	**WBID**	**Miles**	**Health**
Buck Creek	11	0.26	PFC
Buck Creek	11	0.39	PFC
Chicken Creek	18	0.72	PFC
Cranes Creek	14	0.01	FAR
Cranes Creek	14	0.06	FAR
Cranes Creek	14	0.07	FAR
Cranes Creek	14	0.10	FAR
Cranes Creek	14	0.16	FAR
Cranes Creek	14	0.36	FAR
Cranes Creek	14	0.37	FAR
Cranes Creek	14	0.67	FAR
Deep Creek	32	0.54	NF
Deep Creek	32	0.58	PFC
Hancock Creek	11	0.02	FAR
Hancock Creek	11	0.03	FAR
Hancock Creek	11	0.04	FAR
Hancock Creek	11	0.06	FAR
Hancock Creek	11	0.10	FAR
Hancock Creek	11	0.20	FAR
Hancock Creek	11	1.42	FAR
Mill Creek	12	0.15	FAR
Mill Creek	12	0.37	FAR
Mill Creek	12	0.08	PFC
Mill Creek	12	0.19	PFC
Mill Creek	12	0.29	PFC

Mill Creek	12	0.42	PFC
Mill Creek	12	0.88	PFC
Willow Creek	11	0.04	FAR
Willow Creek	11	0.11	FAR
Willow Creek	11	0.13	FAR
Willow Creek	11	0.07	PFC
Willow Creek	11	0.10	PFC
Willow Creek	11	0.31	PFC
Willow Creek	11	0.43	PFC
Willow Creek	11	0.45	PFC
Willow Creek	11	0.73	PFC
Willow Creek	11	1.03	PFC
Willow Creek	11	1.25	PFC

Table J-4. IDL 2002 PFC data.

2002			
Stream	**WBID**	**Miles**	**Health**
MillCr	12	0.26	PFC
MillCrTrib2	12	0.08	FAR
MillCrTrib3	12	0.50	FAR
SeventyCr	13	0.07	FAR
SeventyCr	13	0.29	FAR
CraneCr Seg1	14	0.91	FAR
CraneCr Seg1	14	0.15	FAR
CraneCr Seg1	14	0.03	FAR
CraneCr Seg2	14	1.10	FAR
CraneCr Seg2	14	0.02	FAR
CraneCr Seg3	14	0.81	PFC
CraneCr Upper	14	0.08	FAR
CraneCr Upper	14	0.03	FAR
CraneCr Upper	14	0.06	FAR
CraneCr Upper	14	0.00	FAR
CraneCrTrib #2 Seg1	14	1.14	PFC
CraneCrTrib #2 Seg2	14	0.16	FAR
CranesCr Seg4	14	0.96	FAR
UpperCranesCr	14	0.37	FAR
HomerCr EastFk	18	0.29	FAR
HomerCr EastFk	18	0.37	FAR
HomerCr EastFk	18	0.09	FAR
HomerCr EastFk	18	0.13	FAR
HomerCr Main	18	0.30	FAR
HomerCr Main	18	0.06	FAR
HomerCr MiddleFk	18	0.17	FAR

HomerCr MiddleFk	18	0.11	FAR
HomerCr MiddleFk	18	0.09	FAR
HomerCr Trib1	18	0.12	FAR
HomerCr Trib2	18	0.10	PFC
HomerCr Trib2	18	0.39	PFC
HomerCr Trib3	18	0.37	PFC
HomerCr Trib4	18	0.32	PFC
HomerCr WestFk	18	0.34	FAR
Meadow Cr Trib3	32	0.46	PFC
MeadowCr Lower	32	0.38	PFC
MeadowCr Lower	32	0.04	PFC
MeadowCr Lower	32	0.03	PFC
MeadowCr Trib1	32	0.19	PFC
MeadowCr Trib1	32	0.63	PFC
MeadowCr Trib2 Seg1	32	0.35	FAR
MeadowCr Trib2 Seg2	32	0.35	PFC
Meadowcr Trib2 Seg3	32	0.37	PFC
MeadowCr Trib2 Seg4	32	0.67	FAR
MeadowCr Upper	32	0.04	FAR
MeadowCr Upper	32	0.01	FAR
MeadowCr Upper	32	0.06	FAR
MeadowCr Upper	32	0.09	FAR
MeadowCr Upper	32	0.25	FAR
MeadowCr Upper	32	1.14	FAR
MeadowCr Upper	32	1.30	FAR
MeadowCrTrib1	32	0.14	PFC

Appendix K. Stream Macroinvertebrate Index

Table K-1. Stream Macroinvertebrate Index (SMI) data.

BURPID	STREAM	DATE SAMPLING	SMI	SMI Ranking
1996SIDFZ037	BIRCH CREEK	6/24/1996	32	0
1996SIDFZ038	BIRCH CREEK	6/24/1996	45	2
1996SIDFZ041	BIRCH CREEK	6/25/1996	25	0
1997SIDFL005	BLUE CREEK	6/9/1997	43	2
1998SIDFB001	BRIDGE CREEK	6/3/1998	55	2
1994SIDFA018	BROCKMAN (L)	7/8/1994	34	1
1994SIDFA017	BROCKMAN (U)	7/8/1994	16	0
1998SIDFA002	BROCKMAN CREEK	6/3/1998	34	1
1996SIDFY002	BUCK CREEK	5/23/1996	10	0
1993SIDFA027	BULLS FORK #1 LOWER	8/3/1993		
1993SIDFA028	BULLS FORK #2 UPPER	8/3/1993	20	0
1997SIDFL001	BULLS FORK CREEK	6/5/1997	35	1
1997SIDFM001	BULLS FORK CREEK	6/5/1997	23	0
1997SIDFL010	CANYON CREEK	6/11/1997	18	0
1997SIDFL006	CATTLE CREEK	6/9/1997	13	0
1997SIDFM007	CLARK CREEK	6/10/1997	39	1
1994SIDFA084	CORRAL (L)	8/16/1994	51	2
1994SIDFA083	CORRAL (U)	8/16/1994		
1995SIDFA019	CORRAL CREEK (UPPER)	5/20/1995	39	2
1997SIDFM005	CRANE CREEK	6/9/1997	42	2
1997SIDFM006	CRANE CREEK	6/9/1997	21	0
1998SIDFB009	CRANE CREEK	6/9/1998	24	0
1995SIDFB018	CRANE CREEK (LOWER)	6/26/1995		
1995SIDFB020	CRANE CREEK (UPPER)	6/26/1995		
1998SIDFA001	DAN CREEK	6/3/1998	28	0
1996SIDFY126	DAN CREEK (2)	8/21/1996	58	3
1997SIDFL004	DEEP CREEK	6/9/1997	24	0
1998SIDFB002	EAGLE CREEK NORTH FORK	6/4/1998	50	2
1996SPOCA037	GRAVEL CREEK	7/15/1996	66	3
1998SIDFB007	GRAVEL CREEK	6/9/1998	57	3
1998SIDFB008	GRAVEL CREEK	6/9/1998	56	3
1997SIDFM140	GRAYS LAKE OUTLET	9/11/1997	5	0
1997SIDFM141	GRAYS LAKE OUTLET	9/11/1997	47	2
1995SIDFB067	GRAYS LAKE OUTLET (LOWER)	8/7/1995		
1995SIDFB069	GRAYS LAKE OUTLET (LOWER)	8/8/1995	48	2
1995SIDFB073	GRAYS LAKE OUTLET (UPPER)	8/10/1995	41	1
1995SIDFB080	GRAYS LAKE OUTLET (UPPER)	8/21/1995		
1995SIDFA017	HANCOCK CREEK (LOWER)	6/19/1995	36	1
1995SIDFB019	HANCOCK CREEK (UPPER)	6/26/1995		
1994SIDFA080	HELL (L)	8/15/1994		
1994SIDFA014	HELL (U)	7/6/1994	26	0
1995SIDFA002	HELL CREEK (LOWER)	5/26/1995	13	0
1995SIDFA001	HELL CREEK (MIDDLE)	5/25/1995	24	0
1995SIDFA018	HOMER CREEK (LOWER)	6/19/1995	30	0
1995SIDFB021	HOMER CREEK (UPPER)	6/26/1995		
1997SIDFM002	INDIAN FORK CREEK	6/5/1997	35	0
1994SIDFA082	LAVA (L)	8/16/1994	53	3
1994SIDFA081	LAVA (U)	8/15/1994	69	3
1996SIDFY134	LAVA CREEK (WEST FORK)	9/3/1996	65	3
1997SIDFL007	LONG VALLEY CREEK	6/10/1997	25	0
1997SIDFL008	LONG VALLEY CREEK	6/10/1997	14	0
1995SIDFB022	LONG VALLEY CREEK (LOWER)	6/26/1995		

1995SIDFB027	LONG VALLEY CREEK (UPPER)	7/5/1995		
1993SIDFA030	MEADOW CK #1 LOWER	8/4/1993	15	0
1993SIDFA029	MEADOW CK #2 UPPER	8/5/1993		
1996SIDFY001	MEADOW CREEK	5/22/1996	28	0
1996SIDFZ001	MEADOW CREEK	5/22/1996	29	0
1998SIDFB005	MEADOW CREEK	6/8/1998	50	2
1995SIDFB002	MEADOW CREEK (LOWER)	6/2/1995	16	0
1995SIDFA004	MEADOW CREEK (UPPER)	6/2/1995	45	2
1996SIDFY003	MILL CREEK	5/23/1996	33	1
1995SIDFB014	MILL CREEK (LOWER)	6/19/1995	31	0
1995SIDFB016	MILL CREEK (UPPER)	6/20/1995	28	0
1997SIDFL009	MUD CREEK	6/10/1997	14	0
1997SIDFL003	MUD SPRING CREEK	6/9/1997	59	3
1998SIDFA003	MUD SPRING CREEK	6/4/1998	33	1
1998SIDFA004	NORTH FORK MEADOW CREEK	6/4/1998	60	3
1998SIDFB011	PETERSON CREEK	6/10/1998	36	1
1997SIDFL002	PIPE CREEK	6/5/1997	9	0
1998SIDFB013	PIPE CREEK	6/11/1998	13	0
1998SIDFB012	RIGHT CREEK	6/11/1998	44	2
1997SIDFL012	ROCK CREEK	6/11/1997	25	0
1994SIDFA016	SAWMILL (L)	7/7/1994	20	0
1994SIDFA015	SAWMILL (U)	7/7/1994	29	0
1996SIDFZ003	SELLARS CREEK	5/23/1996	77	3
1995SIDFB023	SELLARS CREEK (LOWER)	6/26/1995	34	1
1995SIDFB017	SELLARS CREEK (UPPER)	6/21/1995	37	1
1995SIDFB013	SEVENTY CREEK (LOWER)	6/19/1995	42	1
1995SIDFB015	SEVENTY CREEK (UPPER)	6/20/1995	25	0
1998SIDFB004	SHIRLEY CREEK	6/4/1998	34	1
1996SIDFZ002	SOUTH FORK SELLARS CREEK	5/23/1996	45	2
1996SIDFZ039	SQUAW CREEK	6/24/1996	22	0
1996SIDFZ040	SQUAW CREEK	6/24/1996	18	0
1993SIDFA026	TEX CK #1 LOWER	8/2/1993	26	0
1995SIDFA106	TEX CREEK (LOWER)	9/5/1995	68	3
1995SIDFB001	TEX CREEK (LOWER)	6/2/1995	32	0
1995SIDFA003	TEX CREEK (UPPER)	6/2/1995	25	0
1995SIDFA107	TEX CREEK (UPPER)	9/5/1995	38	1
1997SIDFL011	TWIN CREEK	6/11/1997	21	0
1998SIDFB006	WAYAN CREEK	6/9/1998	23	0
1994SIDFA079	WILLOW (L)	8/15/1994		
1993SIDFA031	WILLOW CK #1 LOWER	8/4/1993	11	0
1993SIDFA032	WILLOW CK #2 UPPER	8/5/1993	23	0
1997SIDFM003	WILLOW CREEK	6/9/1997	57	3
1997SIDFM004	WILLOW CREEK	6/9/1997	17	0
1997SIDFM008	WILLOW CREEK	6/11/1997	65	3
1998SIDFB003	WILLOW CREEK	6/4/1998	59	3
1995SIDFB049	WILLOW CREEK (LOWER)	8/2/1995	46	2
1995SIDFB066	WILLOW CREEK (LOWER)	8/2/1995		
1995SIDFB070	WILLOW CREEK (LOWER)	8/8/1995	46	2
1995SIDFB068	WILLOW CREEK (UPPER)	8/8/1995	45	2
1995SIDFB071	WILLOW CREEK (UPPER)	8/9/1995		
1995SIDFB072	WILLOW CREEK (UPPER)	8/9/1995	52	3
1995SIDFB081	WILLOW CREEK (UPPER)	8/21/1995		

Appendix L. Distribution List

Idaho Falls Public Library 457 Broadway Idaho Falls, ID 83402	William Stewart Idaho Operations Office Environmental Protection Agency 1435 N. Orchard St. Boise, ID 83706
Richard A. Passey, Co-Chairman Willow Creek Watershed Advisory Group	Lee Leffert, Hydrologist James Capurso, Fisheries Biologist Caribou-Targhee National Forest 1405 Hollipark Dr, Idaho Falls, ID 83401
Heath Hancock, Range Conservationist Idaho Department of Lands 3563 Ririe Hwy Idaho Falls, ID 83401	Dan Kotansky, Hydrologist Pat Koelsch, Fisheries Bureau of Land Management 1405 Hollipark Dr. Idaho Falls, ID 83401
Ivalou O'Dell, Information Specialist USGS Water Resources of Idaho 230 Collins Road Boise, ID 83702	Water Quality Conservationist Idaho Association of Soil Conservation Districts 315 East 5th North St. Anthony, ID 83445
James P. Fredericks, Regional Fisheries Manager Gary Vecillio, Environmental Specialist Idaho Department of Fish and Game Upper Snake Region 4279 Commerce Circle Idaho Falls, ID 83401 – 2198	Christine Fischer, Water Quality Analyst Idaho Association of Soil Conservation Districts 1551 Baldy Ave., Ste. #2 Pocatello, ID 83201
Bonneville County NRCS Office Dennis Hadley, District Conservationist 1120 Lincoln Rd. Idaho Falls, ID 83401	Gary Dixon, CO-Chair Willow Creek WAG
Alicia Lane Boyd Snake River Area Office - East Bureau of Reclamation 1359 Hansen Avenue Burley, ID 83318	Kevin Meyer Idaho Department of Fish and Game 1414 East Locust Lane Nampa, ID 83686
Soil Conservation Commission Kathy Weaver, District Operations Manager 3563 Ririe Hwy Idaho Falls, ID 83402	Soil Conservation Commission Tony Bennett P.O. Box 790 Boise, ID 83701-0790
Environmental Protection Agency	Ron Mitchell

Tracy Chellis, Biologist 1200 6th Avenue OW-134 Seattle, WA 98101	Idaho Sporting Congress P.O. Box 1136 Boise, ID 83702
Rick Johnson Idaho Conservation League 710 North Sixth St Boise, ID 83702	

Appendix M. Public Comments

Public Comments and Responses

Several public meetings were held throughout the process of the development of this TMDL. Meetings were coordinated to facilitate participation by the Willow Creek WAG, landowners, and land management agencies.

The public comment period for the Willow Creek Subbasin Assessment and TMDL was held during March and April 2004. Originally the public comment period was for the duration of 30 days, ending on March 22, 2004 however, at the request of the Willow Creek Watershed Advisory Group and the Idaho Department of Lands (IDL) the DEQ extended the public comment period an additional 30 days, with the period ending on April 24, 2004.

Comments received from agencies, Willow Creek Watershed Advisory Group (WAG), Greater Yellowstone Coalition (GYC), and the public during the comment period are included with responses. Responses to comments are in bold print following the individual comment.

Comments by Idaho Department of Lands

The Idaho Department of Lands appreciates the opportunity to comment on the Willow Creek Subbasin Assessment and TMDLs and thanks you for the extended comment period that was granted. Idaho Department of Lands fully supports comments provided by East & West Side Soil & Water Conservation Districts (SWCDs) and the Willow Creek WAG. We offer the following comments for your consideration.

Executive Summary

In several places pollutant loading targets are referenced as based on literature. This “literature” is not referenced and should be.

The literature reference to loading targets for streambank erosion is referenced in section 5.1, Target Selection (heading), Sediment (subheading), third paragraph, which states that, “It is assumed that natural background sediment loading rates from bank erosion equate to 80% bank stability as described in Overton and others (1995)…”

The above paragraph will be inserted into section 2.3, Biological Data (heading), Streambank Assessments (subheading) for further clarification.

Literature values for the 28% target for subsurface fines are referenced in section 2.3 under Biological Data (heading), Subsurface Fines (subheading).

IDL also feels that the loading estimates should be identified in the executive summary as a gross allotment (per definition on pg 89).

It is not necessary to identify the exact nature of load estimates as “gross allocations” in the executive summary. The mention of “gross allocations” in section 5.3 (page 89) is sufficient.

Beaver Influence in the Willow Creek Subbasin – Little to no mention of beaver and their influence occurs in the Willow Creek Subbasin Assessment and TMDLs. This, despite the fact that beaver have and continue to substantially impact stream morphology and hydrology as well as influence water quality and quantity on listed streams. Significant discussion should be added into the document detailing historical and current beaver influence on listed streams.

A section on beaver and their influence on stream morphology, hydrology, and water quality has been added in section 1.2, Subbasin Characteristics (heading), Beaver (subheading).

It is difficult to discuss historic and current beaver influences on listed streams in specific terms because data providing this level of detail is unavailable. The only information supplied to DEQ, regarding beaver in the subbasin, was anecdotal in nature so beaver influences are discussed in general terms.

<u>Sediment Loading Estimates –</u> We do not have alternative data to offer. However, statements should be included in the document that identify limitations that we believe have skewed estimated sediment loading rates and resulted in an overestimation of those rates. Specifically:

1) Sampling Locations – Sites with high potential for streambank erosion were targeted for sampling by MSE (firm contracted by DEQ to perform inventories), rather than representative reaches. With respect to pre site selection, the report developed by MSE and provided to DEQ states, “MSE examined…7.5-minute maps and digital ortho quad aerial photographs to identify stream areas most susceptible to erosion.” The report goes on to explain how the inventory reach was selected once MSE was on site. Specifically it states, “In accordance with DEQ instructions, MSE selected a reach with evident erosion or with evident potential for erosion based primarily upon land use and practices and the presence of roads.” This lack of representative sampling is corroborated in the MSE document on page six. It states, “It is important to note that our site selection methods were designed to inventory eroding sections of the stream; therefore, the *reaches chosen for the stream erosion inventory were not representative of the streams as a whole.”*

As outlined in Appendix I, the NRCS Stream Bank Erosion Inventory, used in the MSE study, is a field-based methodology, which measures streambank/channel stability, length of active eroding banks, and bank geometry. When developing sediment load allocations (gross allocations) from streambank erosion it is important to measure and evaluate the sources of sediment. Erosion from streambanks more than 80% stable was not computed into the streambank sediment load allocation.

In 2003 DEQ staff field verified the MSE sites and conducted supplemental erosion inventories. From the additional field inspections and inventories, the DEQ determined that MSE field observations were representative of general bank conditions in the inventoried areas.

> In USDA-NRCS Technical Note 99-1 of the Stream Visual Assessment Protocol it states, "The reach should be representative of the stream through that area. If conditions change dramatically along the stream, you should identify additional assessment reaches and conduct separate assessments for each."

While Stream Visual Assessment Protocol was collected by MSE, that data was not considered for the load allocation.

> DEQ did request input from IDL on potential sampling sites in an effort to find areas that were accessible and representative. Many of the sites that IDL specifically pointed out as not being representative, due to road/culvert placement or fence locations were sampled anyway.

IDL input was considered when sample locations were selected. Sites were moved to the best practical locations. DEQ is aware of the limitations in site selection and we corrected them where possible.

> If a representative inventory was the intent, IDL questions the validity of using any data obtained by MSE due to its biased nature. If DEQ chooses to use this data as the basis for determining estimated loading rates, even though it is clearly biased, IDL feels that statements should be inserted into the Subbasin Assessment and TMDLs that outline how sampling sites were selected, and point out that loading estimates are likely high because of it.

Answered above. DEQ and MSE data was used in the development of load allocations. The data is not biased and is part of the data considered for load allocations. As stated in section 5.3, regulations allow that loadings "…may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading,"

2) Small sampling size – The 2001 MSE survey inventoried less than 10% of most subject streams, and in most cases was closer to 5%. As an example, only 1.3% of Grays Lake Outlet was inventoried. In Appendix I (page 163) it states, "The length of the sampled reach is a function of stream type variability where stream segments with highly variable channel types need a large sample, whereas segments with uniform gradient and consistent geometry need less." Streams in the Willow Creek Subbasin are highly variable as stated on page 36. It is clear that the sampling size was inadequate to provide representative results. While time and budgetary restraints make sufficient sampling difficult, it should be stated in the document that sampling size was not in line with the 10-30%

outlined on page 163. With larger sampling sizes, a more representative survey would have been completed.

One individual MSE inventory may have included less than 10% of most subject streams because inventories were done in reaches, which are segments of a stream. Stream “segments” are most often distinct sections of the stream with differing landuse and stream morphology. Reaches were extrapolated to make segments. Breaks in segments were made where landuse and channel geometry differed from the inventoried reach. In addition, to further supplement the MSE inventories, DEQ conducted additional inventories in summer 2003. Between the DEQ and MSE inventories, on average, 25% of the segment (more than one segment per stream) was inventoried before extrapolations were made. So, sample sizes were adequate and well within the range of what would be a statistically valid sample size to represent the overall stream segment’s conditions.

Concerning Grays Lake Outlet, the accessible areas of Grays Lake Outlet were inventoried or evaluated by DEQ staff in 2003. Erosion rates were not tabulated from inventories on Grays Lake Outlet because it was not listed for sediment.

3) SVAP/SECI Method – It does not appear that MSE used this NRCS developed system appropriately. IDL fully supports the SWCD’s comments, which explain this concern in greater detail. IDL questions whether training for MSE staff was adequate and asks what levels of quality control were utilized by DEQ to ensure that data collected by MSE was accurate and representative. IDL also asks why DEQ did not utilize NRCS staff to train MSE technicians.

DEQ staff has completed nine subbasins using these techniques, inventorying over 100 miles of streams. This familiarity with the methodology enables DEQ to efficiently conduct the inventories. To ensure accurate work and a level of consistency, DEQ conducted inspections (field and document) of contractor work for quality assurance. In all occasions, DEQ staff determined that contracted employees conducted work in accordance with DEQ prescribed methods. DEQ did not deem it necessary to solicit contractor training assistance from NRCS. DEQ was not aware that NRCS was interested in partnering for TMDL development.

4) Total Suspended Sediment – Data collected in 2003 by IASCD is not included or referenced in the Subbasin Assessment on page 62, but should be. It should also be noted, that there were no major exceedances documented. While IDL understands that bank and channel sediment contributions to TSS cannot be differentiated, it can be inferred by the very low TSS readings that streambank erosion at the levels estimated was not occurring. Further discussion should be added explaining the relationship of streambank erosion to TSS and the impact of drought/low flows on these two things. IDL fully supports comments provided by the SWCDs on this issue.

Language to summarize IASCD water quality monitoring data, specifically TSS data, has been added to section 2.3, Water Column Data (heading), Total Suspended Sediment (Subheading). As stated in section 2.3, TSS is a measurement of sediment suspended in the water column. TSS is not a measure of surface sediment or the actual deposition of sediment in important fish spawning gravels. Because of this, TSS is not a target in the TMDL, nor were the load allocations based on instream TSS measurements. The presence and quantity of fine materials in fish spawning gravels is a better measure of the impact that sediment is having on a stream's ability to support beneficial uses.

5) BURP, Total Suspended Sediment, PFC, Natural Sensitivity and Geomorphic Risk data does not corroborate SECI data. If BURP data was used, lateral recession rates applied to determine loading estimates would be much less and more in line with actual conditions. This lack of corroboration puts into question the validity of the estimated loading rates. DEQ should give serious consideration to reevaluating the SECI data and adjust the estimated loading rates to appropriate levels.

A recession rate cannot be extrapolated from a percentage of bank stability from BURP data. To determine a recession rate, field observations must be made pertaining to overall bank stability, bank condition, vegetative cover on banks, channel shape, channel bottom, and deposition. This information can only be gained in the field, observing the stream conditions at the time of the erosion inventory. In addition, BURP data is used as a tool to measure overall stream health whereas the function of an erosion inventory is to measure active and potential streambank erosion.

As stated earlier in the subbasin assessment, the geomorphic risk assessment is a preliminary assessment of the potential for geomorphic activity in areas of the watershed. The geomorphic risk assessment is based on geographic data sets and spatial analysis. Field measurements that are collected during streambank erosion inventories are a quantitative method for measuring streambank erosion.

As with the GRA, PFC data is not quantitative and is therefore not useful in the development of load allocations.

6) On page 163, "Field Methods", it states that modifications to the NRCS system were made and documented. What were these modifications? Did these modifications bias data in any way? These modifications should be clearly outlined in this document as well as any potential data bias that may have occurred.

DEQ modifications to the NRCS system are quantitative and do not bias the data in any way. We make estimates of overall streambank stability by determining percent stability from length of stable and unstable banks. The percentage is then compared to the 80% stability target, as documented in section 5.1 of the document.

7) Extrapolation Method – A small percentage of listed streams was inventoried. It is unclear what method was used to extrapolate these inventories to determine estimated loading rates along stream reaches that were not inventoried. Further discussion should be added explaining how this extrapolation was done.

As outlined in Appendix I, Site Selection (heading), stream reaches are inventoried and then specific stream segments, representative of the inventoried reach are established. Segment breaks are made where there is a change in landuse and stream morphology from the inventoried reach. To represent the different morphology and landuse, where possible a reach is inventoried varying segments. Since the inventoried reach is representative of the segment, it can be extrapolated that the entire segment will have the same erosion as the inventoried reach. As stated earlier, between the DEQ and MSE inventories, on average, 25% of the segment (more than one segment per stream) was inventoried before extrapolations were made. Sample sizes were adequate and well within the range of a statistically valid sample size to represent the overall stream segment's conditions.

<u>Temperature Loading Estimates –</u>Temperature TMDLs developed for most streams in the Subbasin are inappropriate given that the data which showed temperature exceedances were collected during some of the lowest flows ever recorded. Specifically:

1) The MSE document provided to DEQ in January of 2002 discusses how temperature loggers were going to be placed in 15 locations throughout the watershed in 2001 (page 1 of the MSE document). It goes on to state that this was cancelled by DEQ due to extended drought and low flows, "because of concerns that any data obtained in these tasks would not be representative of ordinary stream conditions." Despite this, DEQ used data collected by IDFG and USFS in 2001 and developed TMDLs for nearly every stream despite flows that were among the lowest ever recorded. The same conditions that led DEQ to cancel their efforts still existed. Serious consideration should be given to eliminating the temperature TMDLs, because the data collected showing temperature exceedances is not representative of ordinary stream conditions.

Due to the court-mandated schedule associated with TMDLs in the state of Idaho, temperature data is collected and used in all types of climatic conditions; this includes both ends of the climatic spectrum. The schedule will not be abandoned because climatic conditions are not producing what one would consider "ordinary" or optimal stream conditions.

2) Geothermal influences are mentioned on page 11. Geothermal influence on Brockman Creek is evident near the Brockman Creek/Dan Creek intersection. There are two additional geothermally influenced springs on Idaho Endowment Land just upstream from this intersection. If temperature TMDLs are included in the final document, IDL feels that a statement saying "Elevated temperatures on Brockman Creek may be partly influenced by springs that are geothermally heated," should be included in the discussion.

The presence of geothermal springs on Brockman Creek has not been documented through analytical data however, based on your statement, language discussing the possible presence of geothermal springs on Brockman Creek has been added in section 5.4, Load Allocation (heading), Brockman Creek (subheading).

With the possible presence of geothermal springs on Brockman Creek, it becomes even more important to protect riparian vegetation since Brockman Creek has two documented salmonid spawning tributaries, Sawmill and Corral Creek.

3) On page xviii of the Executive Summary, it is stated that "Streambank erosion and reduced riparian vegetation are the causes of increased water temperatures in the subbasin." IDL believes that low flows were the primary cause of elevated temperatures for the year the sampling occurred. While IDL recognizes that erosion and lack of shading also impact stream temperatures, it is a gross overstatement to say they are the only causes. Discussion should be added in the Executive Summary detailing the impact of drought and low flows on stream temperatures.

The above-mentioned sentence has been changed to say, "Streambank erosion, reduced riparian vegetation, and low flow conditions are the causes of increased water temperatures in the subbasin."

The following statement has been added to the executive summary to address the ongoing drought conditions: "Elevated temperatures from reduced riparian vegetation and accelerated streambank erosion have been exacerbated by an ongoing drought in the subbasin."

4) On page 58, stream temperatures are again discussed, with no reference to extended drought conditions and low flows. Discussion should be added detailing the impact of drought and low flows on stream temperature.

This section of the document is strictly for presenting data and summarizing the findings. All of the flow data for the subbasin is presented in the prior section where one can see that flows are lower than average.

Clarks Cut

1) There is no mention of Clarks Cut's historical impact on fisheries or the geomorphology of Grays Lake Outlet. Discussion should be added into the document pointing this out.

The DEQ does agree that the addition of Clark's Cut did have a historical impact on the fishery and overall hydrology and geomorphology of Grays Lake Outlet, however fisheries trend data collected and used in this document was collected after the

construction of the Clark's Cut canal, circa 1906. The declining trend in the fishery, observed in the data, cannot be attributed to the addition of the Clark's Cut canal.

<u>IDL's Conclusion</u>

Clearly, there are problems with most, if not all, of the data collected for the Willow Creek Subbasin Assessment. These problems can be partly attributed to budgetary restraints and limited time frames that prevented more thorough data collection. Possibly the single biggest contributor to the questionable data, was the drought, which made sampling more difficult. Regardless, data limitations that exist are not clearly identified anywhere in the document and should be.

The palatability of the results of the analytical data to land management agencies is the issue in question here. It is known that with all large-scale projects, especially ones with court ordered deadlines, there are unavoidable time and resource constraints. With acceptance and acknowledgement of such constraints the Willow Creek TMDLs were developed utilizing the best available data. DEQ solicited supplemental and more precise data from your agency and none was provided.

Most importantly the document, and specifically the loading estimates and temperature data, lack a foundation based on good science.

The techniques used in the Willow Creek Subbasin Assessment and TMDL are significantly more accurate, scientifically based and robust than any streambank work conducted in the subbasin. Given the size of the watershed, DEQ is certain any refutation of the work will not be undertaken by any entity. If the values reported here are ever validated through the implementation phase, DEQ is confident similar values will result.

The purpose of the TMDL is to address non-point sources of pollution and it is clearly stated in the regulations (40 CFR 130.2(I)) that where data is limited, gross allocations may be made.

IDL is encouraged to provide quantitative data which would allow DEQ to revise the load allocations identified in the document. The TMDL implementation phase allows all Designated Management Agencies the freedom to support or refute land management issues discussed in the document. As IDL progresses through the implementation phase of the TMDL, they will be the only entity deciding any potential land use changes on endowment land. If IDL chooses to participate in long-term water quality characterization and improvement, the watershed stands to reap the benefit.

Sincerely,

L.D. Benedick
Area Supervisor – Eastern Idaho

Comments by Greater Yellowstone Coalition

GYC appreciates the opportunity to submit comments regarding the Willow Creek TMDL. We believe that there are several issues related to the general TMDL process that should be addressed in future work.

The data presented in the TMDL document is quite telling regarding the overall condition of stream health in the Willow Creek Subbasin. It appears that most streams are in "fair to poor" condition and that the characteristics needed to support beneficial uses have been dramatically degraded. The fish data presented in the document shows that native fish populations are down significantly, or in some cases, gone altogether. Both temperature and sediment are dramatically affecting much of the aquatic habitat located in the subbasin. It appears that the streams located throughout the subbasin are in generally poor condition. The degraded state of water quality in the Willow Creek Subbasin is unfortunate, and it should be the focus of future agency/landowner efforts to restore these streams to proper function condition.

One factor that does deserve attention when reviewing the TMDL document is the ongoing drought. Conditions throughout the subbasin have been exacerbated by the drought and have led to lower flows and less vegetation. Recognizing that the drought does play a role is important in assessing current condition. However, the drought should not be used as an excuse to explain the widespread problems in the subbasin. The document identifies land uses throughout the subbasin as being generally homogenous – mostly cattle and sheep production. GYC believes that an important step in the TMDL process is the recognition that certain land uses, in this case sheep and cattle grazing, can have a large impact on stream health. Working in a collaborative way with landowners and other agencies needs to be an integral part of the TMDL process.

We believe that in order for the assessment and TMDL to be worth anything, some sort of regulatory function needs to come after the document has been completed. We realize that an implementation plan will be created, but because of its "voluntary" nature we doubt that much rehabilitation and restoration will actually take place. We suggest that DEQ be more actively involved in the process of working towards improving water quality and stream health. The assessment is a necessary part of the process, but real results come during implementation and enforcement. Simply documenting the "on the ground" problems and then walking away is not an effective way to deal with these issues.

Thank you again for the opportunity to provide comments in this process. Please keep us informed as this process moves forward.

Comments noted.

Sincerely,

Scott Christensen

Greater Yellowstone Coalition

Comments By US Environmental Protection Agency

Thank you for the opportunity to review the draft Willow Creek Subbasin Assessment and TMDLs dated February 2, 2004. EPA would like to acknowledge the large amount of work that went into developing these TMDLs. The following are suggestions which would help to clarify the TMDLs.

Page xxv, Key Findings

For Brockman Creek it states that the TMDL is prescribing an annual loading of 351 tons/mile/year, however Table 43 on page 92 shows that the Load Capacity for Brockman Creek is 25 tons/mile/year with a Load Allocation of -359 tons/mile/year.

Corrected. The prescribed annual loading for Brockman Creek is 25 tons/mile/year.

Buck Creek is left out of the Key Findings section.

Buck Creek is a tributary of Mill Creek and it is located in the Mill Creek assessment unit therefore, Mill Creek load allocations apply to Buck Creek. This language has been added to the Key Findings section of the document.

There is a discrepancy in the current estimated sediment load for Corral Creek between the Key Finding section and the Current Load listed in Table 43.

Corrected. The current estimated erosion rate for Corral Creek is 226 tons/mile/year.

For Willow Creek it states that the TMDL is prescribing an annual loading of 199 tons/mile/year, however Table 43 on page 92 shows a Loading Capacity for Willow Creek is 14 tons/mile/year with a Load Allocation of -199 tons/mile/year.

Corrected. The prescribed annual loading for Willow Creek is 14 tons/mile/year.

Page xxxi, Table B

It is being recommended that Ririe Lake be de-listed for sediment because it has not been assessed. Justifications for de-listings need to follow the guidelines in 40 CFR 130.7(b)(6)(iv).

Statements made in the Key Finding section of this document justify the desisting in accordance with 40 CFR 130.7(b)(6)(iv) which states that…"flaws in the original analysis that led to the water being listed" is a legitimate reason for delisting a water.

Aquatic conditions in the reservoir environment differ from that of streams. Current

biological indices for cold water aquatic life apply to streams, not reservoirs. Given this, the Ririe Reservoir listing for sediment should be delisted, because there was insufficient data to compile an accurate assessment.

Page 50, 2.2 Applicable Water Quality Standards

The Water Quality Standards for temperature, sediment and nutrients should be listed in this section.

Corrected. Language with regards to temperature, sediment, and nutrient water quality standards has been added in section 2.2 of the document.

Page 65, Total Suspended Sediment

The first paragraph on page 65 states that based on Table 31 all but one of the TSS samples meet the best conditions rating of <25 mg/L, however Hell Creek had a TSS reading of 36 and Tex Creek had readings of 59 and 62.

Corrected. Language added to eliminate discrepancy.

Page 66, Nutrient Data

It is noted that at the Pole Bridge sampling site on Willow Creek six samples exceeded the nitrogen criteria and that of all the locations sampled nutrient levels were highest on Sellers Creek with nitrate + nitrite levels elevated on every occasion and phosphorous levels that were above criteria on three occasions. Based on the data provided in Appendix F, for both Sellers Creek and Willow Creek at Pole Bridge, a nutrient TMDL should be completed.

Corrected. Nutrient TMDLs for total Phosphorus and nitrite + nitrate nitrogen were completed and added to the TMDL portion of the document.

Page 89, Sediment

An 80% bank stability target is selected for this Subbasin. Please provide more detail as to why this target works for this Subbasin. Are the specific reference streams in other Subbasins that are similar to streams in the Willow Creek Subbasin?

The 80% stability target works for this subbasin because reference streams were located in Idaho's Salmon River Basin in Rosgen A, B, and C channel types with plutonic, volcanic, metamorphic, and sedimentary geology types. The Willow Creek Subbasin's geology is sedimentary and volcanic in nature and geologic conditions are similar to reference stream geology.

Page 93, Load Allocation

Several streams, including Birch and Long Valley are listed in the TMDL Load Allocation section even though no TMDL was developed for them.

Corrected. Language on Long Valley Creek and Birch Creek has been removed from the TMDL section of the document.

EPA appreciates the opportunity to comment on the draft Willow Creek Subbasin Assessment and TMDLs and we look forward to the final submission. If you have any questions regarding the comments, please contact me at 206-553-6326.

Sincerely,

Tracy Chellis
TMDL Project Manager

Comments from Willow Creek Advisory Group

As chairmen for the Willow Creek WAG we would like to thank the DEQ for the extended time period for the comments. We hope that the extra time may enable a few more landowners to comment about the streams on their private property.

As spokesmen for the WAG we have attended several meetings in regard to the TMDLs and Sub-basin Assessments. We do not profess to be experts in any of the fields that is covered in this document, however we do concur with all agency technical advisers and their comments on this document. With that in mind we have a few comments also.

The Executive Summary under Key findings on pages xxv-xxix you have listed each stream with a current estimated erosion rate, and then a TMDL prescribed sediment-loading rate. (i.e. Corral Creek 854 tons/mile/year, 18 tons/mile/year). However on page 90 under sediment paragraph four it is stated there is a large degree of uncertainty as to the percentage of sediment loading available before beneficial uses are no longer supported. That indicates to us that DEQ does not know the natural erosion rate, so how can DEQ prescribe a sediment loading rate.

It is true that there is a large degree of uncertainty as to the percentage of sediment loading available before beneficial uses are no longer supported. In the absence of long term and extensive studies in this subbasin it is extremely difficult to know the assimilative capacity of the stream and the actual natural background sediment loading rates. In the absence of extensive data, literature values must be used to make the best and most accurate estimate of natural background loading in the subbasin. The DEQ is required by federal mandate and litigation to develop a sediment-loading rate (TMDL) for streams impaired by sediment and regulations clearly state that loadings "…may range from reasonably accurate estimates to gross allotments, depending on the availability of data and appropriate techniques for predicting the loading."

As to the equation for calculation the erosion rate we believe it to be viable for finding the rates, however we feel the results should state what percent of the stream is in that condition. We believe that when and if the TMDLs are developed some of the goals will not be feasible or attainable.

Publishing large-scale generalizations with regards to stream conditions is problematic. TMDLs were developed for several streams where conditions varied considerably and blanket percentages do not fully characterize the conditions over the entire stream length.

In regards to the temperature data that has been gathered for this report, we realize that it is just one point in time, but due to the severe drought conditions over the past three to five years we feel that any data that was collected is not representative of the watershed.

Comment noted.

As spokesmen for the WAG, concerning the site selection (pg 177) it states that typically between 10 and 30 percent of the stream needs to be inventoried. If that was the case, there should be a lot more references to the jobs that the beaver are doing. We believe there should be much more data concerning the beaver complexes in this drainage.

A section on beaver and their influence on stream morphology, hydrology, and water quality has been added in section 1.2, Subbasin Characteristics (heading), Beaver (subheading).

In conclusion as chairmen of the WAG, and after many hour of studying this document, because of the severe drought conditions over the last three to five years we do not agree with most of the data in this report, and cannot except it at this time. We believe that a lot more data needs to be collected in all fairness to the watershed it self.

The DEQ understands your concerns regarding the impact of severe drought conditions on the outcome of the Willow Creek Subbasin Assessment and TMDL. Unfortunately the Subbasin Assessment and TMDL process must continue despite climatic conditions. The opportunity to collect additional data and further characterize the subbasin exists in the implementation phase of the TMDL, as administered by designated land management agencies.

Thank You,

Richard A. Passey	Gary Dixon
Co-Chairman	Co-Chairman
(208) 523-1596	(208) 523-5486

Comments from Rick Passey, Private Landowner

As a landowner in this drainage (Seventy Creek) I would like to thank you for the opportunity to comment on this document.

On 10-26-01 I had the opportunity to not only walk Seventy Creek with the crew of MSE (Johnna Evans and Tony May) and Sheryl Hill (DEQ water quality specialist) but to also observe MSE as they assessed the reach in their document. We started down stream at an old beaver complex about 1 mile from the reach. There was no assessment completed on any of the stream including the beaver complex until we arrived where the cows were drinking. As stated in their report the timing was a typical for that part of the stream.

Comment noted.

Last year I believe that Melissa Thompson (DEQ water quality specialist) also walked portions of this stream. I do not know the exact date, but I believe the only place that she assessed the stream for stream bank erosion was the old beaver complex. As we all know the natural cycles of most streams are, some portions are depository and some are transport. When in that cycle eventually the depositor becomes the transport.

Melissa Thompson preformed assessments below the Beaver Complex (just above road to Passey residence) therefore, the old beaver complex was not included in the TMDL.

As a landowner my greatest concern for the stream is erosion. I also know that when a beaver complex goes out is has to erode. If I count every beaver complex on Seventy Creek there are four old ones (not holding water) and four new ones. If one considers the fact that we are still in a sever drought that is amazing.

Comment noted.

In conclusion, because of all the beaver complexes in Seventy Creek, I do not believe that the erosion rate (288 tons/mile/year) is accurate. I also do not believe that the prescribed loading rate (11 tons/mile/year) is attainable or feasible at all.

Comment noted.

Thank You

Comments from East & West Side Soil and Water Conservation Districts (E&W SWCD) NRCS and IASCD

<u>Participants:</u>
Willow Creek Watershed Advisory Group (WAG)
Natural Resources Conservation Service (NRCS)
East & West Side Soil and Water Conservation Districts (E&W SWCD)
Idaho Department of Lands (IDL)
Idaho Association of Soil Conservation Districts (IASCD)

Purpose: To comment on the Willow Creek Subbasin Assessment and TMDL. Provide assistance to DEQ in commenting on the data, describing concerns, and making subsequent recommendations.

Accomplishments:
> Reviewed: "Final Streambank Erosion and Subsurface Sediment Monitoring Report Willow Creek Watershed" (Referred to as "Report") prepared by Millennium Science and Engineering, Inc., (MSE) for the Idaho Department of Environmental Quality (DEQ) for use in Willow Creek TMDL.
> Reviewed: "Willow Creek Geomorphic Risk Assessment" prepared by Spatial Dynamics for IDEQ for the Willow Creek TMDL.
> Reviewed: SVAP scoring sheets and the Streambank Erosion Condition Inventory (SECI) worksheets from the TMDL.

The following comments, questions and recommendations are submitted in response to the request by the Idaho Department of Environmental Quality (IDEQ) for comments regarding the Willow Creek TMDL and Subbasin Assessment. These comments are divided into two sections. Section A contains general feedback from the East & West Side Soil and Water Conservation Districts, NRCS and IASCD. Section B contains specific comments and concerns in the document. The above participants appreciate the opportunity to submit the following comments for your consideration and recognize the challenges of developing cost effective and defensible TMDLs. Because of time constraints in reviewing the TMDL, we would like to thank you for the extended comment period that was granted. We also value the efforts that have been set forth by the Department of Environmental Quality in assembling and analyzing the information contained in the Document. We look forward to continuing this partnership throughout the TMDL process.

Section A. General Comments:

Temperature Loading Estimates:

Referring to the Key Findings section (xxii), it is stated that temperature TMDLs were developed in all streams where temperature data has been collected and shows an exceedance of temperature criteria in greater than 10% of observation days during spring or fall spawning periods. It is further stated that thermograph data collected established that temperature TMDLs were necessary to meet the numeric salmonid spawning criteria.

1. The MSE document (Pg.1) provided to DEQ in January of 2002 discusses how temperature loggers were to be placed in 15 locations throughout the watershed in 2001. MSE further states that this course of action was cancelled by DEQ due to extended drought and low flows, "because of concerns that any data obtained in these tasks would not be representative of ordinary stream conditions." Contrary to this statement, DEQ used temperature data collected by IDFG and USFS in 2001 for the development of temperature TMDLs on nearly every stream listed. It should be noted in regards to temperature, that the last three years combined are considered the driest periods ever recorded (Appendix 1). These conditions of low flow and drought that

led DEQ to cancel their efforts of logger installation still currently persist. These conditions warrant thorough explanations and serious discussion throughout the Document; specifically in the Key Findings section because the data collected showing subsequent temperature exceedances is not representative of ordinary stream conditions.

The MSE statement is not accurate. Due to the court-mandated deadline associated with TMDLs in the state of Idaho, temperature data is collected and used in all types of climatic conditions; this includes both ends of the climatic spectrum. Deadlines cannot be ignored because climatic conditions are not producing what one would consider "ordinary" or optimal stream conditions.

2. Additionally, it is stated in the Key Findings section (xxiii) that "Streambank erosion and reduced riparian vegetation <u>are</u> the causes of increased water temperatures in the subbasin." Although erosion and lack of shading are certainly factors involved in temperature increases, it would be advantageous to also recognize that record low flows and extended drought conditions during the year that sampling occurred have compounded these exceedances, which consequently may skew ordinary stream conditions; refer to website for supplemental data: (*http://nwis.waterdata.usgs.gov/id/nwis/annual*). Grays Lake should also be mentioned as a possible cause of temperature increase in the watershed considering the Lakes low water levels and that Willow Creek is its natural outlet via Grays Lake Outlet. Further discussion should be outlined in the Executive Summary or Subbasin Assessment detailing the effects of drought and low flows on stream temperatures as well as throughout the Document whenever discussing temperature.

The above-mentioned sentence has been changed to say, "Streambank erosion, reduced riparian vegetation, and low flow conditions are the causes of increased water temperatures in the subbasin."

The following statement has been added to the executive summary to address the ongoing drought conditions: "Elevated temperatures from reduced riparian vegetation and accelerated streambank erosion have been exacerbated by an ongoing drought in the subbasin."

Flow data indicating that controlled flows from Grays Lake Outlet vary is not available. It is clear however, there is limited flow from Grays Lake to Grays Lake Outlet because of the Clarks Cut diversion. The elevated temperatures in the Willow Creek subbasin cannot be attributed to low flows from Grays Lake when the entire drainage is below that point. The tributary influences are much more significant than such a small flow contributed by Grays Lake.

Section 2.3, Flow Characteristics (heading) clearly presents flow data in the Willow Creek subbasin. It is not necessary to explicitly discuss flow regimes in every section of the document. The reader should be able to make judgments based on the data presented in the document.

3. On (Pg.58), stream temperature data is again discussed in regards to Cold Water Aquatic Life (CWAL) and Salmonid Spawning (SS). There is no reference to the extended drought conditions and prolonged low flows; refer to website: (*http://water.usgs.gov/pubs/wdr/wdr-id-03-1/*). The support status of cold water aquatic life and salmonid spawning beneficial uses are influenced by physical factors such as water quality and habitat structure, as well as water quantity. We feel discussion should be added detailing potential impacts of stream temperature exceedances with consideration to the impacts on CWAL and SS. Also, on (Pg.78), observed elevated stream temperatures are discussed that warrant load allocations for all temperature listed streams in the watershed and the development of temperature TMDLs on four non-listed streams. Specifically, "Temperature data showed elevated stream temperatures are common throughout the watershed." There is no reference to extended drought or low flows as a possible cause except for mention of Seventy Creek. However, under the next section of Data Gaps, "extremely dry conditions experienced in the watershed over the past several years" are mentioned for the absence of depth fine data. Low flow conditions certainly are prevalent throughout the watershed and should be noted as such in reference to stream temperature data.

Section 2.3. Water Column Data (heading), Stream Temperature Data (subheading) is a section for presenting raw data not drawing conclusions about data.

The following sentence has been added to section 2.3, Conclusions (heading), "Low flow conditions from continuous low water years may be partly responsible for elevated stream temperatures."

Section 2.3, Flow Characteristics (heading) clearly presents flow data in the Willow Creek subbasin. It is not necessary to explicitly discuss flow regimes in every section of the document. The reader should be able to make judgments based on the data presented in the document

Site Selection: Sampling Size and Locations

1. Under Site Selection (Pg.177) it states that sample reaches were used and "Typically between 10 to 30 percent of the streambank needs to be inventoried." There is question as to where these percentages are derived from. Percentage guidelines are not stated in the SVAP Document as part of the protocol. SVAP states that "The length of the assessment reach should be 12 times the active channel width." Additionally, it states "The length of the sampled reach is a function of stream type variability where stream segments with highly variable channel types need a large sample, whereas segments with uniform gradient and consistent geometry need less." Many of the streams in the Willow Creek Subbasin are highly variable. This is supported on (Pg.36) with, "Geomorphic characteristics of the streams in Willow Creek subbasin vary considerably." Moreover, the MSE Report shows that less than 10% of most selected streams were inventoried. It is evident that the sampling size was inadequate to provide representative results. This may partially

explain some of the discrepancies noted between observed conditions, notes and ratings in the TMDL Document and MSE Report. Overall, larger sample sizes are recommended. Nonetheless, there is awareness that time and budget restraints make sufficient sampling difficult.

The streambank erosion inventory method used in this TMDL is not the SVAP method. DEQ does not see how this statement applies to the guidelines presented in Appendix I, Streambank Erosion Inventory Method.

One individual MSE inventory may have included less than 10% of most subject streams because inventories were done in reaches, which are segments of a stream. Stream "segments" are most often distinct sections of the stream with differing landuse and stream morphology. Reaches were extrapolated to make segments. Breaks in segments were made where landuse and channel geometry differed from the inventoried reach. In addition, to further supplement the MSE inventories, DEQ conducted additional inventories in summer 2003. Between the DEQ and MSE inventories, on average, 25% of the segment (more than one segment per stream) was inventoried before extrapolations were made. So, sample sizes were adequate and well within the range of what would be a statistically valid sample size to represent the overall stream segment's conditions.

2. In the Final Streambank Erosion and Subsurface Sediment Monitoring Report produced by MSE, it states on (Pg.2) that MSE was instructed to identify stream areas most susceptible to stream erosion with no indication of reference sites. Basically, sites with high potential for streambank erosion were targeted for sampling by MSE, rather than representative reaches. "MSE examined… 7.5 minute maps and digital ortho quad aerial photographs to identify stream areas most susceptible to erosion." Specifically it states, "In accordance with DEQ instructions, MSE selected a reach with evident erosion or with evident potential for erosion based primarily upon land use and practices and the presence of roads." The selected reaches included in the inventory do not appear to be representative of the watershed as a whole. There is also a corroborative statement of this on (Pg.6) of the MSE Report. Furthermore, stream reaches immediately adjacent to such channel disturbances (roads) are rarely indicative of watershed channel conditions. In Tech Note 29 of SVAP it is stated that "The reach should be representative of the stream through the area. If conditions change dramatically along the stream, you should identify additional assessment reaches and conduct separate assessments for each." The site selection process brings about questions of the precision of data obtained by MSE on the basis of its non-random nature.

As outlined in Appendix I, the NRCS Stream Bank Erosion Inventory, utilized in the MSE study, is a field-based methodology, which measures streambank/channel stability, length of active eroding banks, and bank geometry. When developing sediment load allocations (gross allocations) from streambank erosion it is important to measure and evaluate the sources of sediment. Erosion from streambanks more than 80% stable was not computed into the streambank sediment load allocation.

In 2003 DEQ staff field verified the MSE sites and conducted supplemental erosion inventories. From the additional field inspections and inventories, the DEQ determined that MSE field observations were representative of general bank conditions in the inventoried areas.

Reach breaks and extrapolation breaks were made where channel morphology and landuses changed.

Streambank Assessment and Data:

The SVAP (Stream Visualization Assessment Protocol) ratings shown in the MSE Report seem to be inappropriate due to the drought conditions and insufficient water in the channel at the time of rating. Some of the scored parameters do not apply when there is no water flowing in the channel such as distinguishing what bankfull height is, channel condition or bank stability. IASCD stated that there has not been a bankfull condition in the last two to three years; refer to: (http://id.water.usgs.gov/public/h2odata.html). Additionally, the difficulty in recognizing the difference between unstable, bare eroding banks and the bare banks normally below the water surface would lead to scores for "channel condition" and "bank stability" being not representative of "normal conditions." Furthermore, "undercut vegetation" noted may have actually been good quality "overhanging vegetation" but due to drought conditions and beaver activity it was not seen as such.

1. SVAP – The Document (Pg.70,71) states that all streams assessed by MSE received primarily a 'poor' to 'fair' rating for stream health yet there was no mention of drought or record low flows as a possible cause. The BLM and IDL conducted PFC (Proper Functioning Condition) surveys and results show that the vast majority of stream miles assessed were considered healthy (PFC) and healthy but at risk (FAR). This comparison seems to suggest that the streams are actually "proper" to "functioning" in condition despite the 'poor' to 'fair' SVAP rating. We suggest that there be some mention of this variance in the Document. Similar studies in the Medicine Lodge Creek Streambank Assessment Summary (Appendix 2) show comparative results between the PFC range and SVAP ratings. The majority of PFC (94.6%) was rated as PFC to FAR and parallel SVAP ratings (81.4%) in Good to Fair condition. Additionally, Streambank Erosion Condition Inventory (SECI) percentages were in support of this correlation with primarily Slight to Moderate (98%) erosion problems. These comparisons lead us to believe that SVAP ratings conducted by MSE for the Willow Creek TMDL are low. Of all streams listed on (Table 36) of the Document, 80% were listed in 'poor' condition, which leads to the question; is there really that great of a difference between the PFC and SVAP ratings in the Willow Creek watershed? The table in the Medicine Lodge Report also assigned the PFC ratings with each of the corresponding Reaches sampled, which gave a more precise and visual correlation between SVAP and PFC. This type of table would also be a beneficial tool in the Willow Creek Document on (Pg.70).

The PFC results from IDL and BLM may show that the majority of the streams were PFC and FAR however, the majority of those streams are functional at risk.

Since reaches other than those inventoried by MSE and DEQ were inventoried for PFC and SVAP it is difficult to say that there is a variance or that one inventory is inaccurate. In addition, PFC and SVAP inventories were conducted at different times in different years therefore it is additionally difficult to draw across the board comparisons between the two methods.

2. According to SVAP, "To assess stream health, we need a benchmark of what the healthy condition is." There is question of what, if any, streams in Willow Creek were used as benchmark or reference reaches to determine potential conditions of 303d listed streams. Because of this, how can SVAP, which is used by MSE, indicate what is poor, fair or good? In order for this protocol to work, there needs to be assessments done on a couple of reference or representative stream reaches. These reference reaches and corresponding data indicate what the health of the stream is to judge the rest of the sampled streams by.

Comment noted. SVAP ratings were used as a general characterization of stream conditions and data was not used in the development of TMDLs

3. SVAP Method – Furthermore, it does not appear that MSE used the SVAP system developed by NRCS appropriately. MSE data shows that SVAP is 'poor' to 'fair' on all listed streams. SVAP ratings seem to be low compared to observed conditions. This would show discrepancies in field operations that could indicate a general lack of understanding of how the observed channel conditions fit within the various assessment methods and how SVAP is utilized to depict those conditions. This seems to be true of most of the inventory completed during the 2001 field season in the Willow Creek watershed. This creates the question on whether training for MSE staff was adequate. It states on (Pg.2) of MSE, that Pocket Water, Inc. conducted a one-day training session for all field staff prior to field activities. This training was based on the "Monitoring Protocols to Evaluate Water Quality Effects of Grazing Management on Western Rangeland Streams" (Bauer and Burton, 1993), which MSE followed for conducting Streambank Stability Inventories. It would then seem logical that the inventory field methods for SVAP would be conducted by and/or training provided by the corresponding agency that developed them. The NRCS was not the responsible agency for evaluating stream health in this case. Additionally, each selected site was rated for erosion using the SECI (Stream Erosion Condition Inventory) worksheet originally developed for local use only with training as approved by the NRCS state geologist. NRCS did not participate in any training of the work crews using the worksheet. In the Medicine Lodge Watershed Subbasin Assessment, the Soil Conservation Commission in cooperation with the NRCS conducted a complete stream bank assessment on private land(s) using SVAP, SECI and PFC. We would like to have seen this type of collaboration for data collection in the Willow Creek TMDL. Also, the question arises as to what levels of quality control were utilized and implemented by DEQ to ensure that data collected by MSE was accurate and representative of the reaches sampled.

Comment noted. DEQ did extend an invitation to NRCS and the SWCD to participate in 2003 erosion inventory work and no staff participated or expressed interest in participating. DEQ conducted inspections (field and document) of contractor work for quality assurance. In all occasions, DEQ staff determined that contracted employees conducted work in accordance with DEQ prescribed methods.

Recession Rates, Sediment, etc:

1. BURP, Natural Sensitivity and Geomorphic Risk data does not seem to corroborate SECI data. If BURP data was used, lateral recession rates applied to determine loading estimates would be much less and more in line with actual conditions. This lack of correlation puts into question the validity of the estimated loading rates and as to why lateral recession rates were so skewed in the Willow Creek Subbasin Assessment. The trends should be similar on what direction the watershed is moving. For instance, in the Medicine Lodge Streambank Erosion Inventory lateral recession rates are comparatively lower and more in line with observed conditions. Subsequently, the Willow Creek field inventory represents an atypical rather than a more representative "annualized" condition due to drought and low flows with the stream being essentially dry. Because discrepancies were so prevalent, this would suggest that the sediment loads that DEQ arrived at could be considerably lower. Assignment of erosion rates using the existing inventory results for even the individual sites described would be difficult due to the discrepancies. DEQ should give serious consideration to reevaluating the SECI data and adjust the estimated loading rates to appropriate levels.

A recession rate cannot be extrapolated from a percentage of bank stability from BURP data. To determine a recession rate, field observations must be made pertaining to overall bank stability, bank condition, vegetative cover on banks, channel shape, channel bottom, and deposition. This information can only be gained in the field, observing the stream conditions at the time of the erosion inventory. In addition, BURP data is purely a reconnaissance level investigation used for water quality assessments. Alternately the function of an erosion inventory is to measure active and potential streambank erosion.

The geomorphic risk assessment is just a preliminary assessment of the potential for geomorphic activity in areas of the watershed. The geomorphic risk assessment is based on geographic data sets and spatial analysis. Field measurements that are collected during streambank erosion inventories are a quantitative method for measuring streambank erosion.

The load allocations are based on an annual loading rate from streambank erosion inventories (not SVAP) therefore; the TMDL is based on an "annualized" condition. The conditions observed in the fall represent some of the potential sediment delivery in

the spring, during high flow conditions, when sediment transport is greatest. The DEQ does not share the opinion that there are discrepancies, therefore, the loading rates are appropriate and will not be altered at this time.

2. Total Suspended Sediment: On (Pg.63) it is stated that all of the TSS samples, except one, meet the best condition criteria (<25 mg/L). This is based on TSS data collected by the BLM. On the other hand, IASCD water quality data (Appendix F, Pg.155) shows that all but two TSSediment samples (Meadow & Birch Creek) met best condition criteria (<25mg.L) and had four exceedences when looking at TSSolids. Furthermore, the IASCD Water Quality Data is not referenced in this section. It would seem to be that sediment loads would be <u>lower</u> due to a low TSS combined with high temperature and low flows caused by drought conditions. If the TSS is very high and total SECI is very high this would suggest that the stream is eroding tremendously. TSS and SECI should be fairly comparable. Low TSS levels reflect that the flows in the subbasin were not significant. TSS levels, temp levels, drought and low flows all point to insufficient water in channel to get significantly high sediment loads. There has to be substantial flows in order for erosion to take place. Mention of low flows and drought with regard to TSS and SECI needs to be addressed in the Findings Section. In general, through stream inventories suggesting very high sediment loads, natural background sediment loads could possibly be lower, due mainly in part to low flows, high temps, and low TSS. Because the water quality samples collected by DEQ were obtained during continuing dry weather conditions, results should not be considered indicative of “the true potential for agricultural impacts on water quality.”

Language to summarize IASCD water quality monitoring data, specifically TSS data, has been added to section 2.3, Water Column Data (heading), Total Suspended Sediment (Subheading). As stated in section 2.3, TSS is a measurement of sediment suspended in the water column. TSS is not a measure of surface sediment or the actual deposition of sediment in important fish spawning gravels. Because of this, TSS is not a target in the TMDL, nor were the load allocations based on instream TSS measurements. The presence and quantity of fine materials in fish spawning gravels is a better measure of the impact that sediment is having on a stream’s ability to support beneficial uses.

Erosion can take place in both high and low flow conditions; spring runoff has a significant ability to transport sediment. Some of the BURP assessments for the 303(d) listed streams were conducted in wetter than average years and beneficial use support was not attained during high flow events. Given this, it cannot be said that the streams are impaired due to drought conditions.

3. Extrapolation Method: From looking at the inventory data, between 10 and 20 percent of streams were inventoried. What data analysis was used to extrapolate total stream sediment loads?

As outlined in Appendix I, Site Selection (heading), stream reaches are inventoried and then specific stream segments, representative of the inventoried reach are established. Segment breaks are made where there is a change in landuse and stream morphology from the inventoried reach. To represent the different morphology and landuse, where possible a reach is inventoried varying segments. Since the inventoried reach is representative of the segment, it can be extrapolated that the entire segment will have the same erosion as the inventoried reach. Between the DEQ and MSE inventories, on average, 25% of the segment (more than one segment per stream) was inventoried before extrapolations were made. So, sample sizes were adequate and well within the range of what would be a statistically valid sample size to represent the overall stream segment's conditions.

4. Beaver Activity: Due to drought and low flows, more discussion needs to be directed towards the relationship between sediment loads, shift in hydrology and the impacts on stream morphology due to beaver influence in the Willow Creek watershed. Beavers significantly affect fluvial geomorphology of a stream. Active-established beaver complexes are noted in the Report with ratings of severe channel instability and erosion. That combination would be highly unusual as beaver do not usually persevere in highly unstable streams. Beaver dams normally serve as sediment retention or storage areas rather than an erosion or sediment producing area. More discussion needs to be mentioned in the document on these effects, encompassing historical and current beaver influences under the Hydrology Section (Pg.7) or wherever you see fit.

A section on beaver and their influence on stream morphology, hydrology, and water quality has been added in section 1.2, Subbasin Characteristics (heading), Beaver (subheading).

5. Under Field Methods, (Pg.177) it states that the NRCS document (1983) outlines field methods used in this inventory. "However, slight modifications to the field methods were made and are documented." There is no reference to these modifications. There should be some outlined discussion of these modifications following this statement. There is further question as to how these changes may have biased streambank erosion or channel stability inventories. This should also be clearly documented accordingly.

DEQ modifications to the NRCS system are quantitative and do not bias the data in any way. We make estimates of overall streambank stability by determining percent stability from length of stable and unstable banks. The percentage is then compared to the 80% stability target, as documented in section 5.1 of the document.

<u>Section B. Specific Comments:</u>

1. Under Key findings (section xxiii), Brockman Creek has a prescribed sediment-loading rate of 351 tons/mile/year. On Table 43 (Pg.92), under Sediment Load Allocation findings, there is a prescribed load of 25 t/mi/y. There's a discrepancy

between the prescribed annual loading rate of 351 t/mi/y and the tables load capacity erosion rate of 25 t/mi/y, which is presumed to be the prescribed annual loading rate. This is also the case of Willow Creek with a prescribed loading rate of 199 t/mi/y and a contradictory load capacity of 14 t/mi/y listed in the table. Furthermore, under (section xxiii), Corral Creek is stated to have a current erosion rate of 854 t/mi/y, yet on (Pg.92) Table 43 it is stated to have a current load of 226 t/mi/y. After reviewing all other streams listed and comparing estimated and prescribed loading rates to the data listed in Table 43, there are inconsistencies with only these three streams. There also seems to be some confusion between sediment yields and sediment loads.

Corrected in the document. Brockman Creek's prescribed sediment loading rate is 25 tons/mile/year, Willow Creek's load capacity is 14 tons/mile/year. The current erosion rate for Corral Creek is 226 tons/mile/year.

2. Clark's Cut should be mentioned in the "Key Findings" section relating to its contribution to temperature increases, historic impact on fisheries and sediment loading versus background levels. Also, reference to its relationship with Grays Lake Outlet.

The DEQ does agree that the addition of Clark's Cut did have a historical impact on the fishery and overall hydrology and geomorphology of Grays Lake Outlet, however fisheries trend data collected and used in this document was collected after the construction of the Clark's Cut canal, circa 1906. The declining trend in the fishery, observed in the data, cannot be attributed to the addition of the Clark's Cut canal.

3. Sediment loads were also established for Sellars, Mill and Tex Creeks (Pg.92), which are corroborated under the "Key Findings" section for each creek. However, under streambank assessment data, (Pg.70) inventories of these creeks are not listed. How can there be an established load when there is no inventory for these streams?

Streambank assessments were not conducted on Tex Creek since banks met the 80% stability target. The sediment TMDL for Tex Creek was based on road erosion modeling. Erosion inventory data for Mill Creek is already located in the section on streambank assessment data. Erosion inventory summary data for Sellars Creek will be added to the table.

4. General grazing trends should be noted in the document where applicable on the Willow Creek watershed. It should be indicated here that reaches would look different in the later fall during or following the grazing period, with noticeable impacts to vegetation and water clarity due to grazing and water access. These impacts may not be long-term.

DEQ is unaware of what the grazing trends are in the subbasin. Grazing trend information was not provided by the land management agencies for the Subbasin Assessment. Sediment deposition in spawning gravels is one of the final indicators of the impacts of sediment on beneficial use support, regardless of water clarity impacts

from grazing access. Reduced vegetative cover contributes to elevated stream temperatures at critical times.

5. Under water quality standard Sec 2.2 (last sentence of first paragraph). The appendix was mislabeled and should be appendix D instead of appendix C. (Appendix C is the Unit Conversion Chart)

Corrected.

Conclusion Statement:

Overall, we feel inventory discrepancies and the lack of consistency in observed conditions and data collection may cause difficulties in the extrapolation procedures used to evaluate the watershed as a whole. Furthermore, using the existing inventory for assignment of erosion rates for the various sites listed would be difficult due to these discrepancies. Using the current erosion rates derived from these sites as being “representative” of the watershed would be flawed. We recommend reevaluation of erosion rates as well as temperature TMDLs, TSS samples and SECI/SVAP data as stated in the above comments. Also, we would like to see reference throughout the Document in regards to drought and low flow conditions as well as subsequent consequences. It would be difficult to base future management decisions on interpretations from this extreme condition without amendment towards a more typical condition.

Through the process of implementation, land management agencies will be able to field truth and re-evaluate DEQ’s field data and overall assessment of water quality. At that time, perceived discrepancies and inconsistencies may come to light.

The ongoing drought is a perplexing issue and the DEQ does not dispute the fact that dry climatic conditions have occurred in the Willow Creek Subbasin for several years. That said, the drought is not the sole reason for the lack of beneficial use support in the 303(d) listed streams. Streams were assessed as impaired prior to the drought conditions, some during high water years.

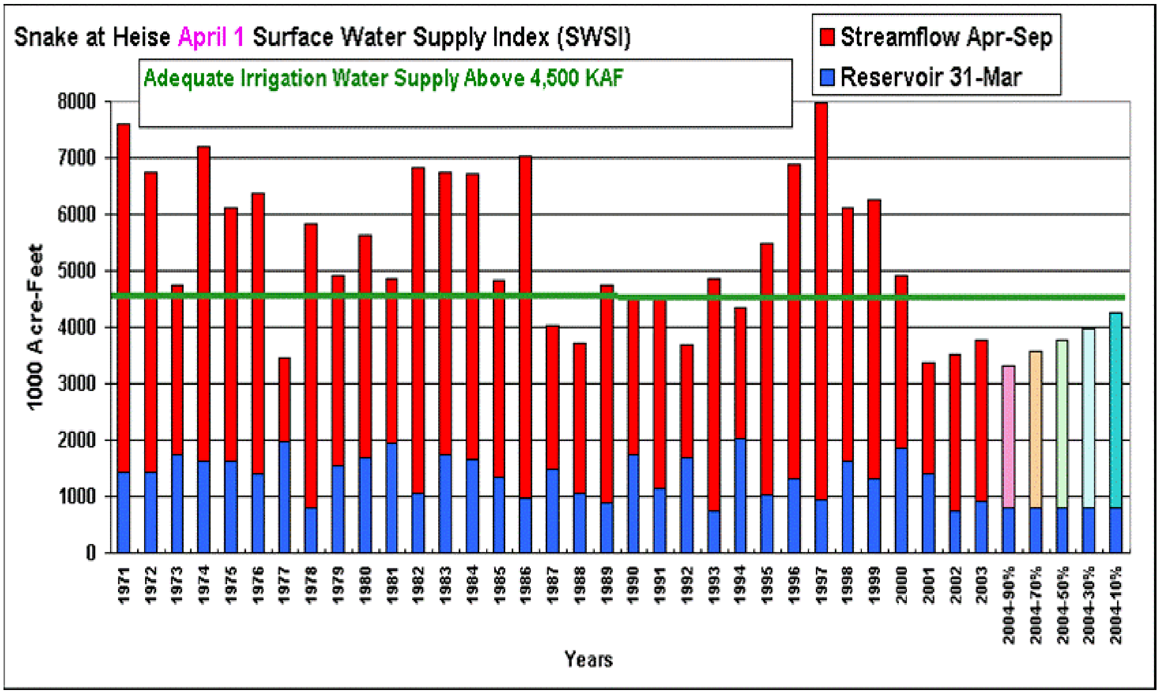
The above listed participants certainly appreciate the opportunity to comment on the Willow Creek TMDL and Subbasin Assessment and again thank you for the extended comment period. We recognize that many of these problematic issues can be partially attributed to limited time frames within the TMDL process and subsequent budget restraints that do occur. We are aware that these factors may also be impediments in the data collection process. We hope our continuing partnership throughout the TMDL process, now and in the future, will endure as a joint venture allowing progress to move forward and management decisions to be carried out. Questions or further information that you may require in regards to the above comments can be referred to the NRCS field office in Idaho Falls.

Thank you.

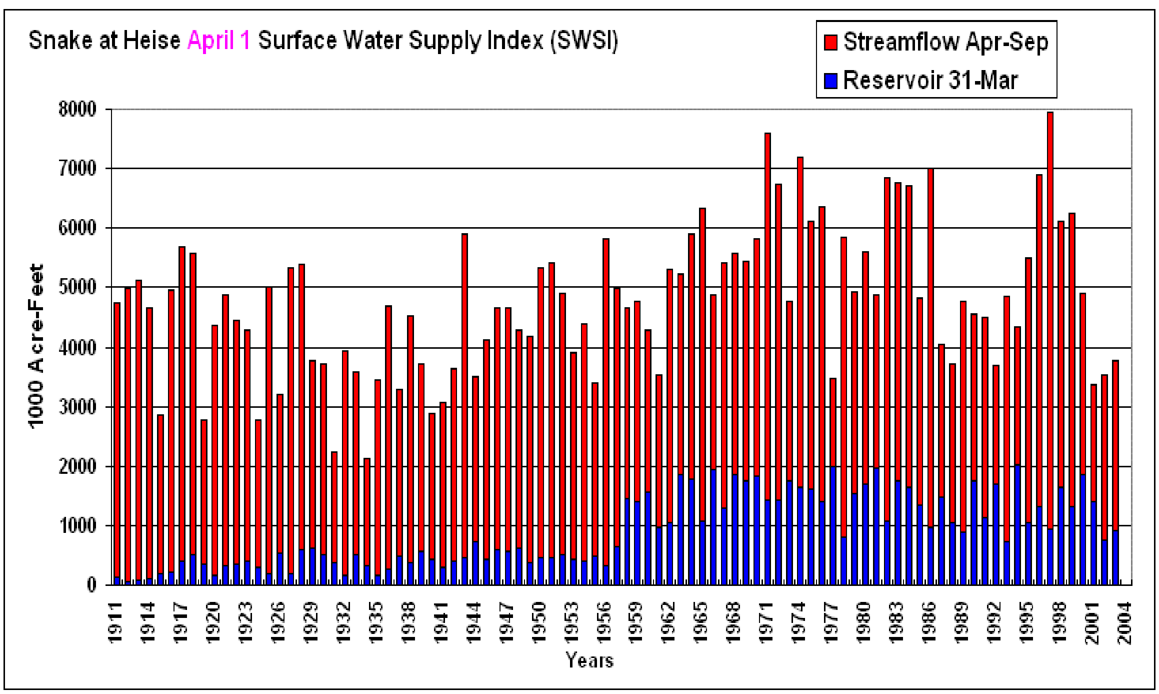
Sincerely,

East & West Side SWCD
NRCS
IASCD

Appendix 1

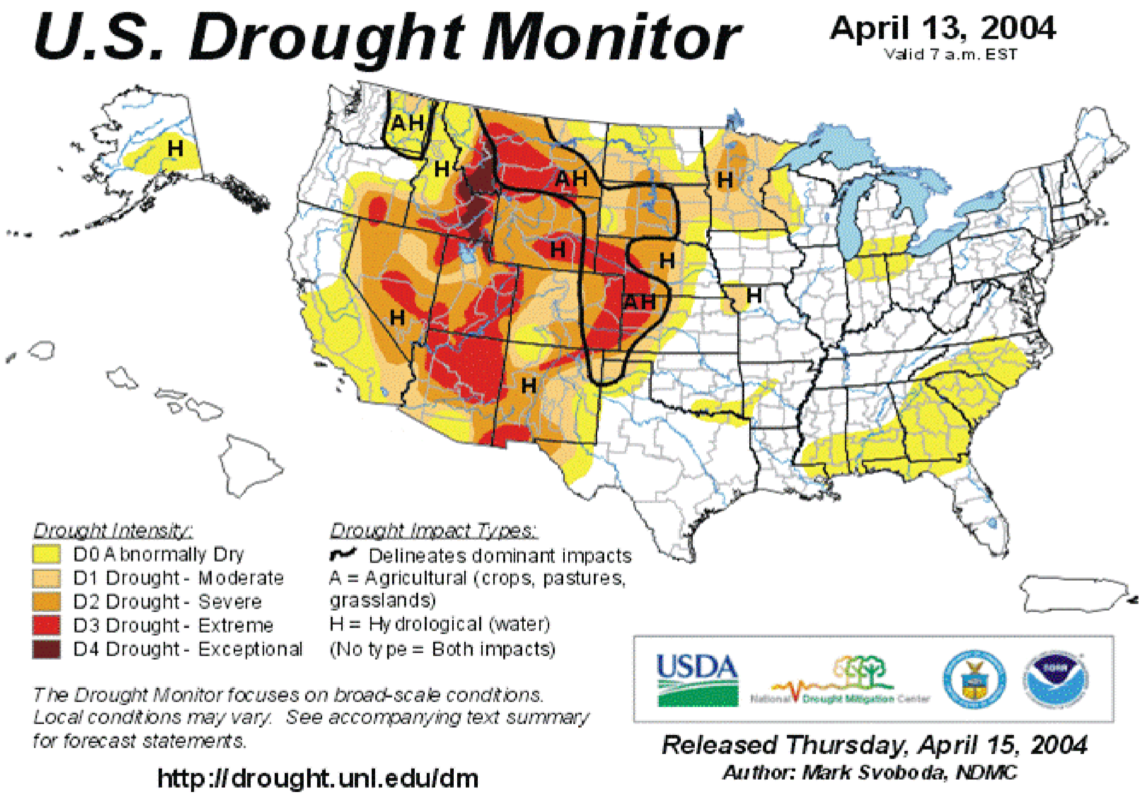


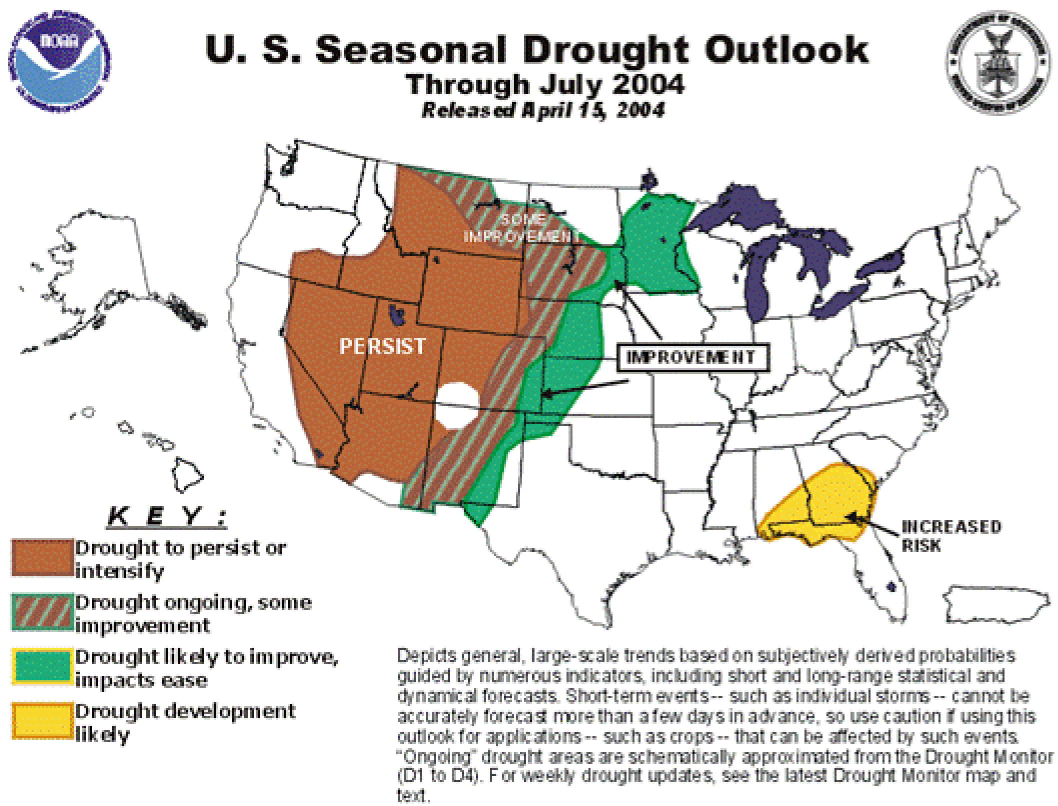
Snake at Heise April 1 Surface Water Supply Index (SWSI)
Adequate Irrigation Water Supply Above 4,500 KAF
Streamflow Apr-Sep
Reservoir 31-Mar
1000 Acre-Feet
Years



Snake at Heise April 1 Surface Water Supply Index (SWSI)
Streamflow Apr-Sep
Reservoir 31-Mar
1000 Acre-Feet
Years

Appendix 1


U.S. Drought Monitor
April 13, 2004
Valid 7 a.m. EST
Drought Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
Drought Impact Types:
Delineates dominant impacts
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)
(No type = Both impacts)
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
http://drought.unl.edu/dm
USDA
Released Thursday, April 15, 2004
Author: Mark Svoboda, NDMC


U. S. Seasonal Drought Outlook
Through July 2004
Released April 15, 2004
SOME IMPROVEMENT
PERSIST
IMPROVEMENT
INCREASED RISK
KEY:
Drought to persist or intensify
Drought ongoing, some improvement
Drought likely to improve, impacts ease
Drought development likely
Depicts general, large-scale trends based on subjectively derived probabilities guided by numerous indicators, including short and long-range statistical and dynamical forecasts. Short-term events -- such as individual storms -- cannot be accurately forecast more than a few days in advance, so use caution if using this outlook for applications -- such as crops -- that can be affected by such events. "Ongoing" drought areas are schematically approximated from the Drought Monitor (D1 to D4). For weekly drought updates, see the latest Drought Monitor map and text.

Appendix 2

Medicine Lodge Creek Subwatershed Stream/Riparian Assessment Summary

Reach	Remainder Length	Erodible Bank	SVAP	PFC/ Range	SECI Remainder	RemainderTons/Year	SECI Erodible	Erodible Bank Tons/Y	Tons/ Mile
M1& M2	1.7	0.1	Poor	FAR/High	Slight	69	Moderate	31	55
M3	1.7	0.1	Fair	PFC/Mid	Slight	59	Moderate	22	44
M4-A	0.4	0.05	Poor	FAR/Mid	Severe	142	Severe	15	342
M4-B&M5-A	1.1	0.05	Fair	PFC/Mid	Slight	61	Slight	2	57
M5-B	0.7		Fair	FAR/Mid	Slight	10			15
M6-A	1.3	0.03	Fair	PFC/Mid	Moderate	87	Moderate	2	67
M6-B	1.6	0.1	Fair	FAR/High	Slight	93	Severe	53	84
M7	1.4	0.09	Good	PFC/High	Slight	23	Moderate	11	22
M8-A	0.9	0.4	Poor	FAR/Mid	Moderate	130	Severe	139	203
M8-C	1.5	0.1	Good	FAR/Mid	Slight	69	Severe	34	64
M9	1.7	0.02	Good	PFC/Mid	Slight	58	Moderate	4	37
M10-A	0.9	0.1	Fair	PFC/Low	Slight	36	Severe	36	71
M10-B	1.3	0.5	Fair	FAR/Mid	Slight	61	Severe	156	122
M11	2.1	0.2	Good	PFC/Low	Slight	52	Severe	41	40
M12-A	1.5	0.09	Fair	FAR/High	Slight	86	Severe	31	74
M12-B	1.3	0.3	Poor	N/Mid	Moderate	177	Severe	125	190
M13	1.1	0.2	Fair	FAR/Mid	Slight	50	Severe	74	94
M14	0.6	0.05	Fair	FAR/High	Slight	17	Moderate	11	43
M15	0.7		Good	PFC/Mid	Moderate	18			27
M16	1.0		Fair	PFC/Low	Slight	17			16
M17	1.5		Fair	PFC/Mid	Moderate	41			27
M18	0.2		Poor	FAR/Mid	Moderate	12			55
Total	**26.3**	**2.6**				**1368**		**719**	**###**

Streambank Erosion Condition Inventory-Remainder	
Percent of stream with a Slight Erosion Problem	75%
Percent of stream with a Moderate Erosion Probl	23%
Percent of stream with a Severe Erosion Problem	2%
Total Percent of Stream asses:	100%
Streambank Erosion Condition Inventory-Eroding Banks	
Percent of stream with a Slight Erosion Problem	2%
Percent of stream with a Moderate Erosion Probl	18%
Percent of stream with a Severe Erosion Problem	80%
Total Percent of Stream asses:	100%
Stream Visual Assessment Protocol	
Percent of stream in Poor Condition	18.5%
Percent of stream in Fair Condition	54.9%
Percent of stream in Good Condition	26.5%
Percent of stream in Excellent Condition	0.0%
Total Percent of Stream assessed	100.0%
Proper Functioning Condition Checklist	
Percent of stream rated Proper Functioning Cond	47.5%
Percent of stream rated Functional at Risk (FAR)	47.1%
Percent of stream rated Nonfunctional (N)	5.4%
Total Percent of Stream assessed	100.0%